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NOTE:—Illustrated articles are marked with an asterisk (*). Look for general subject rather than the specific titles of the articles. Thus: "Automotive," "Bridges," "Railways," etc., will give related articles much more quickly than reference to the titles.

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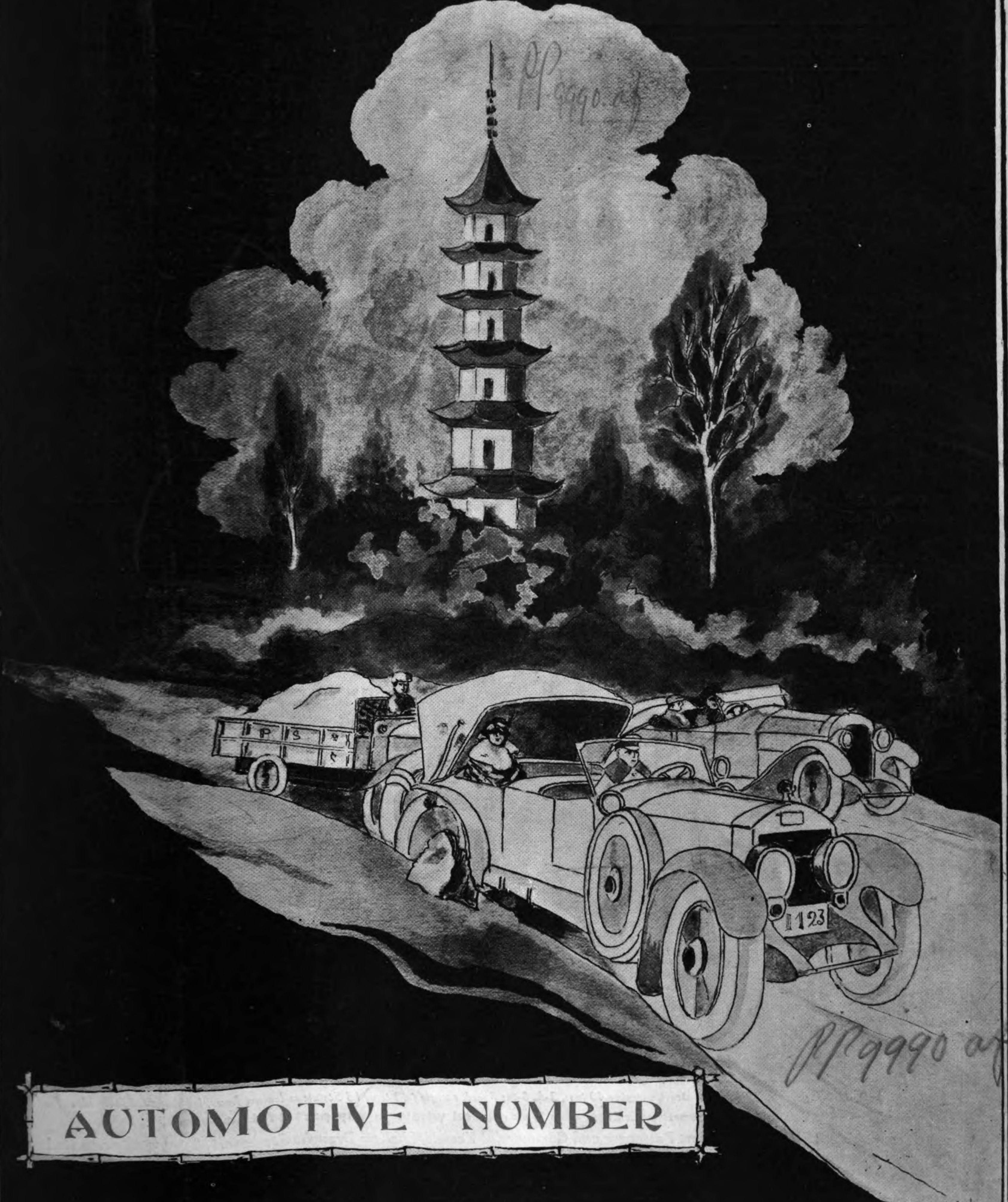

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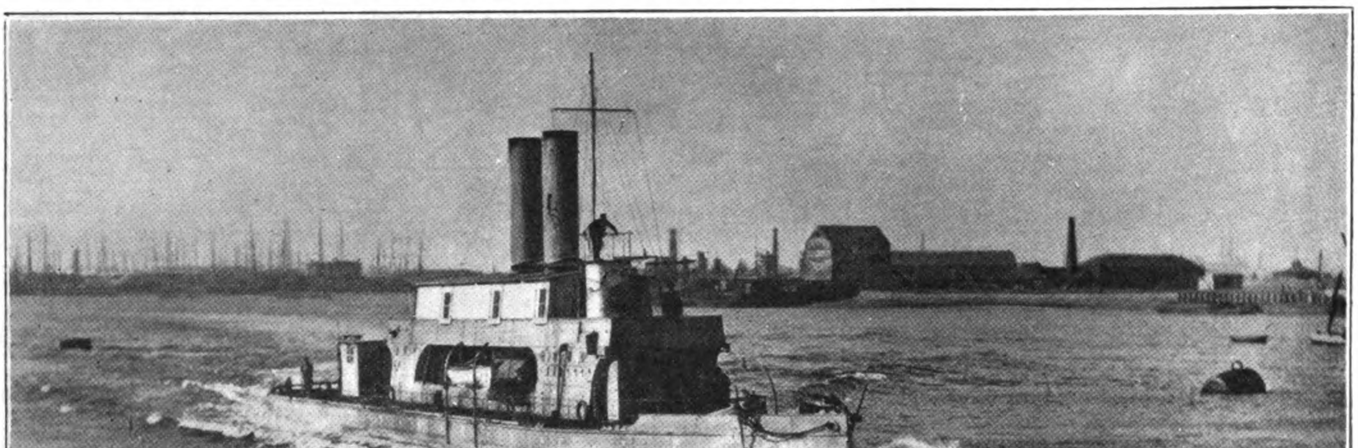

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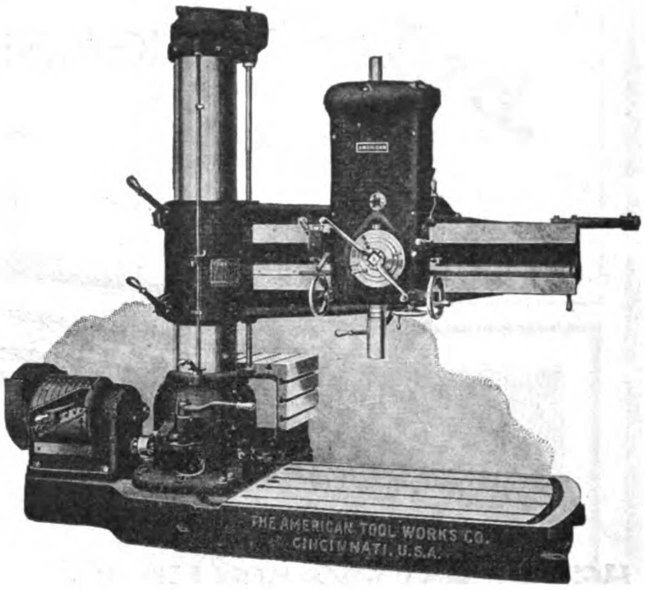

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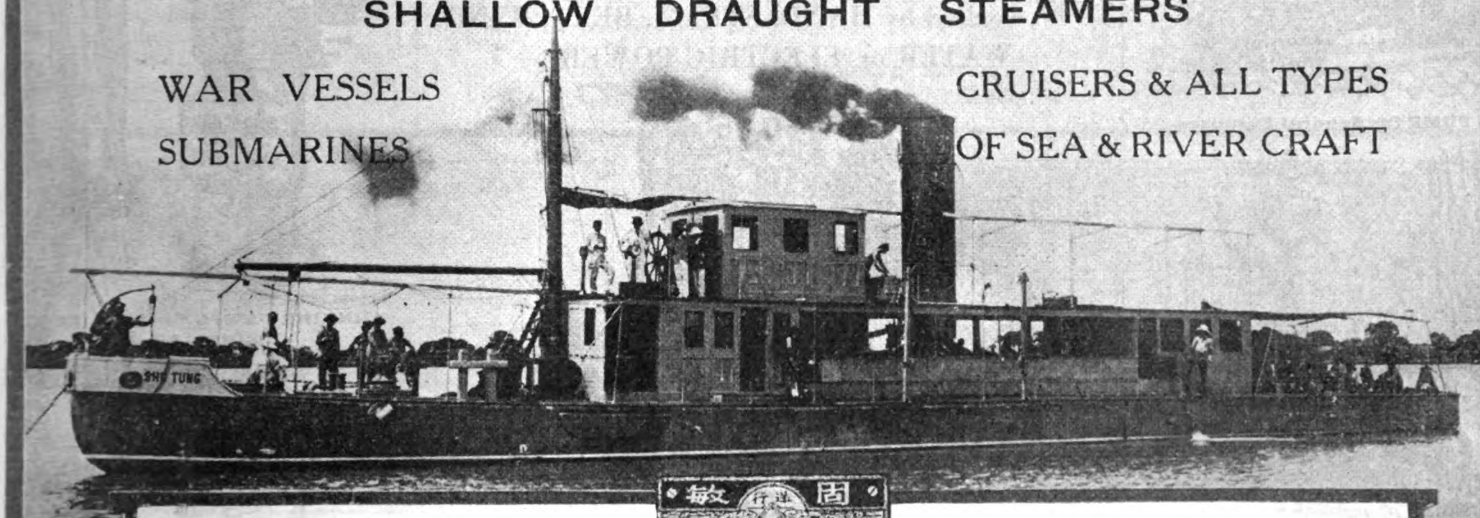

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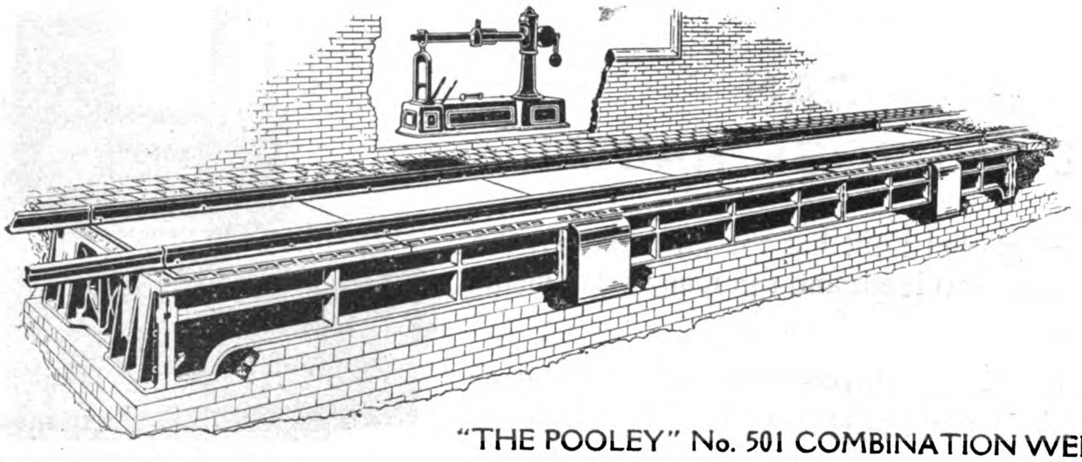

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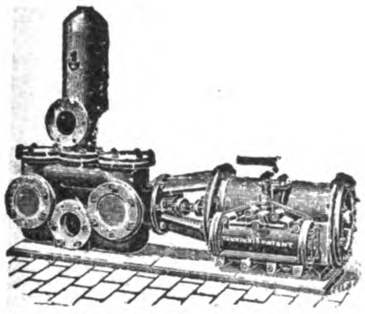

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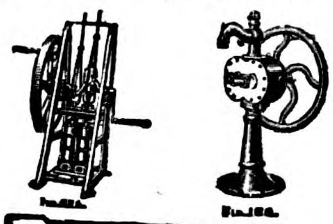

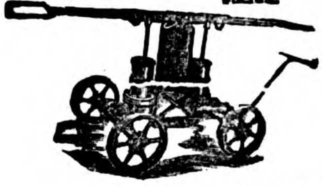

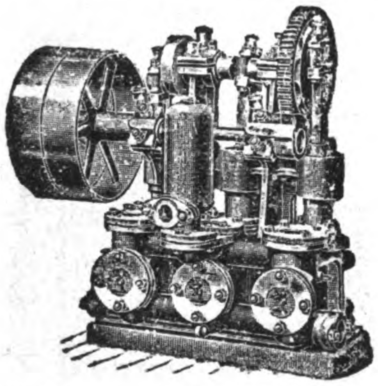

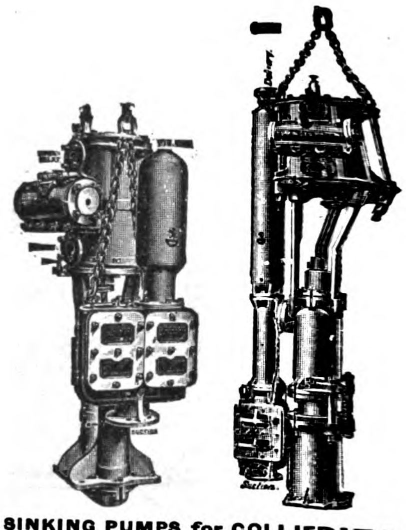

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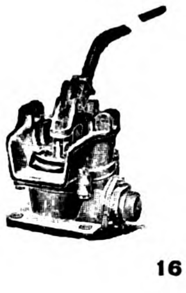

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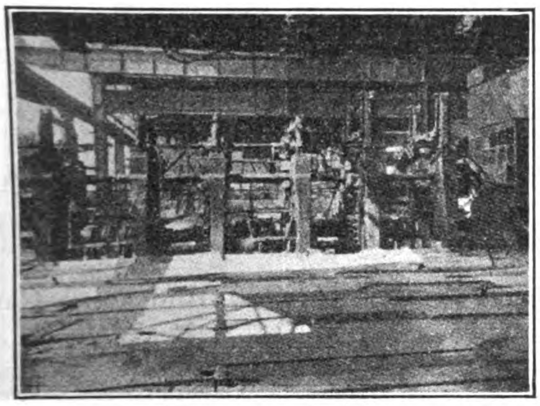

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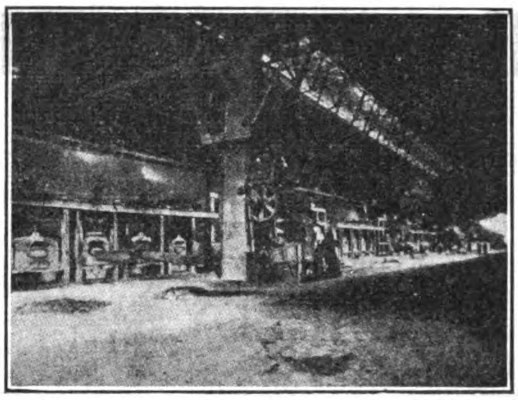

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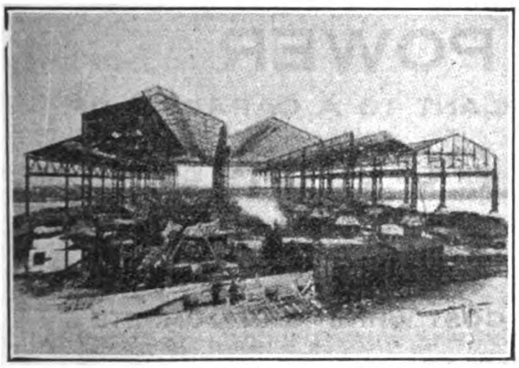

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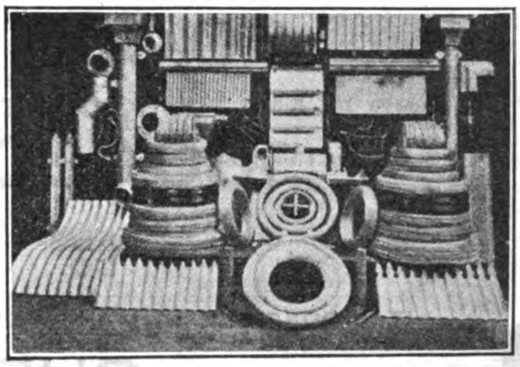

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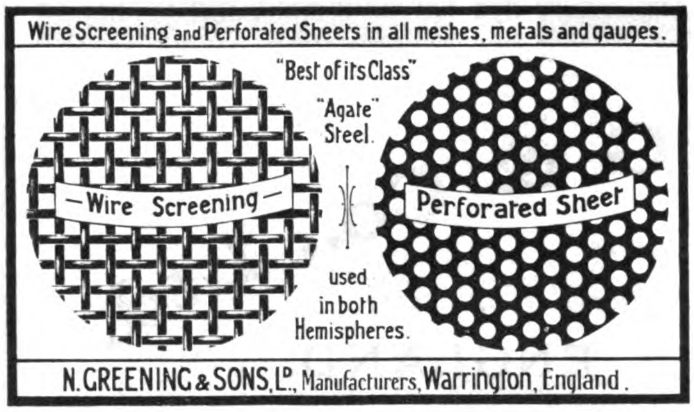

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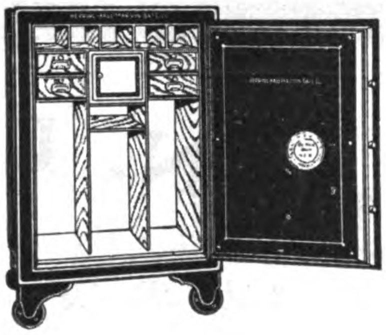

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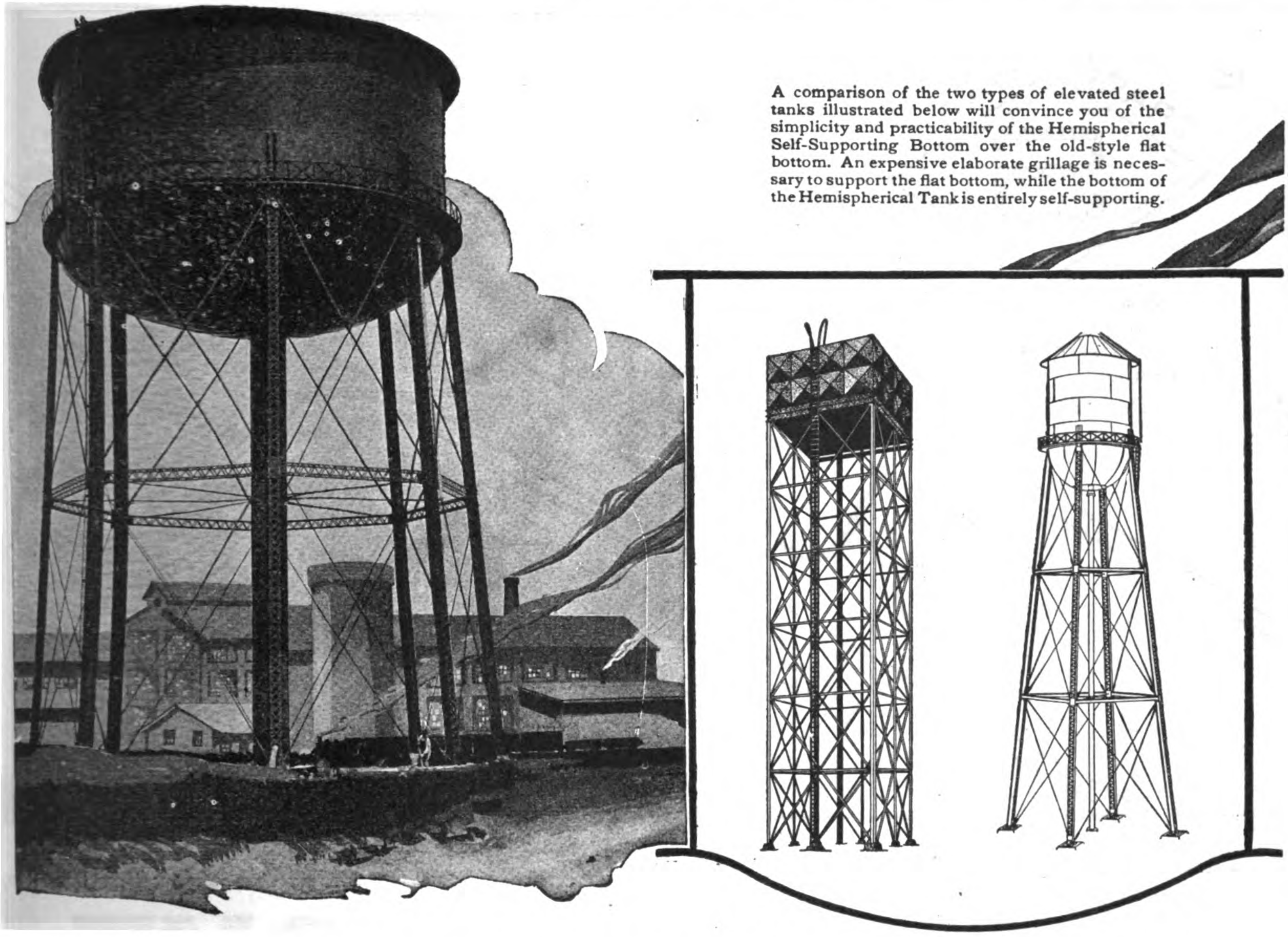

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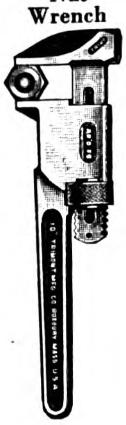

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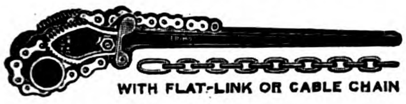

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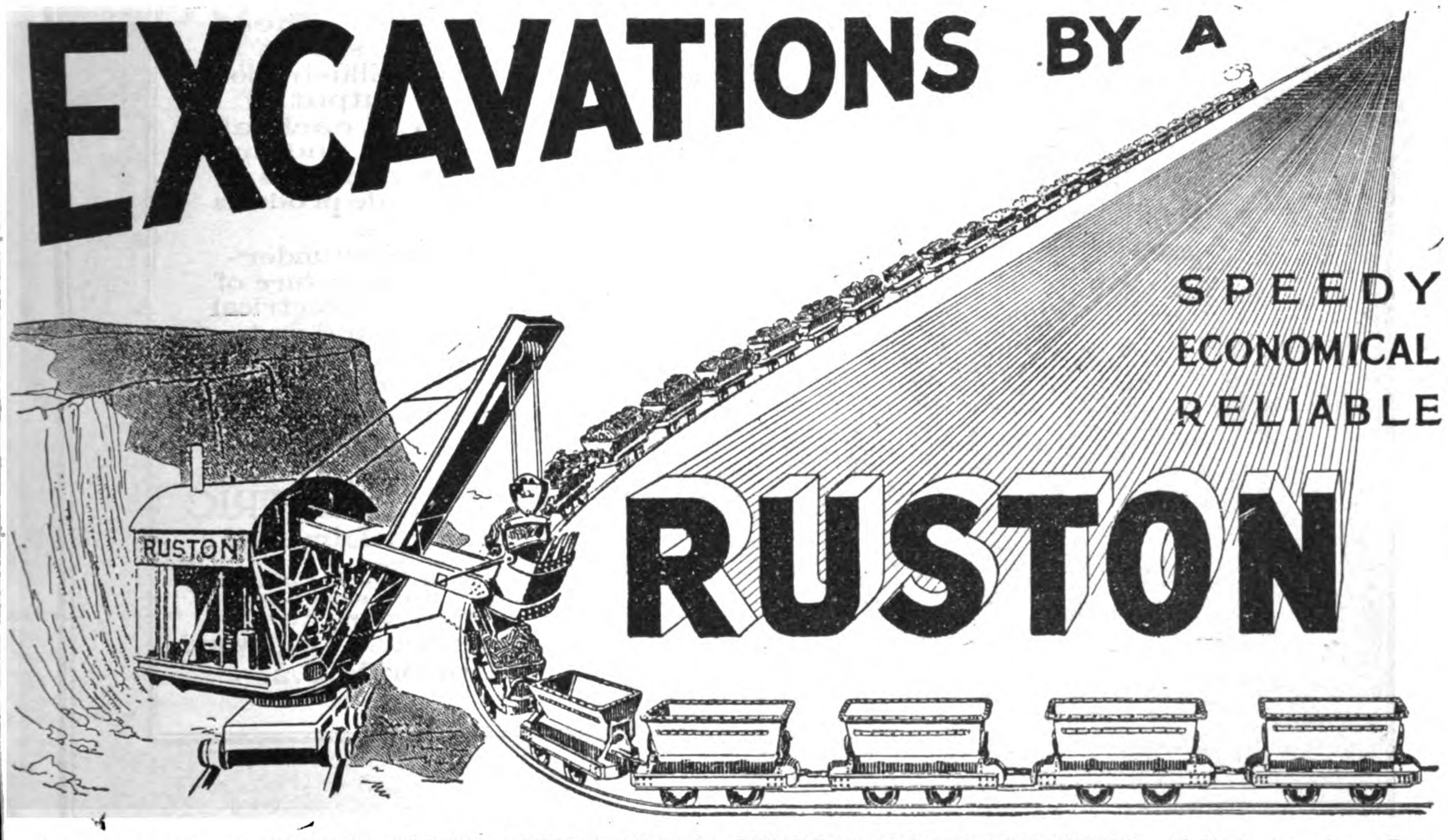

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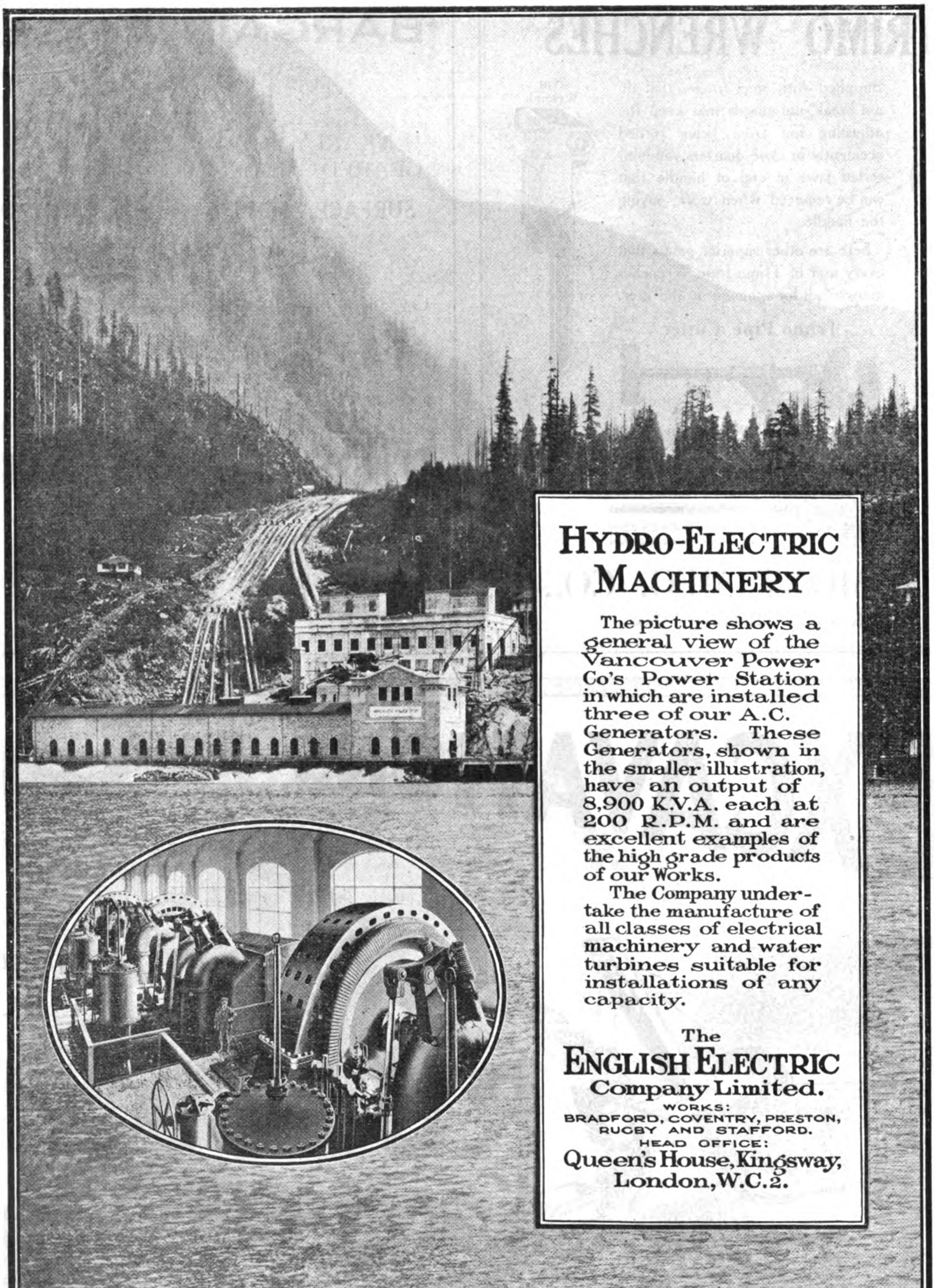

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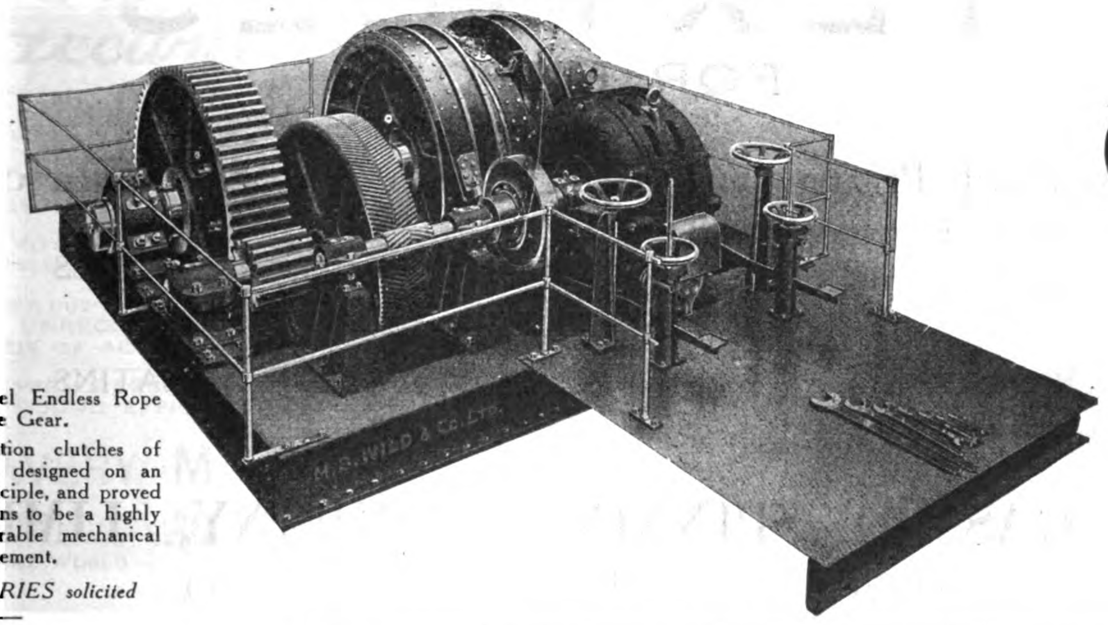

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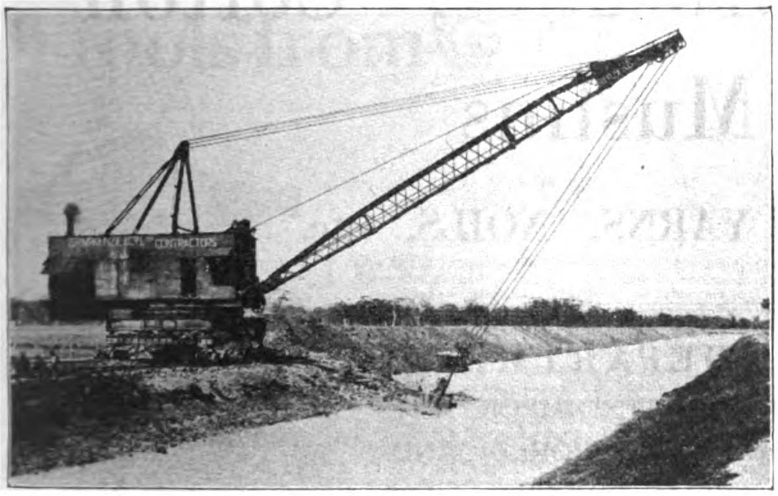

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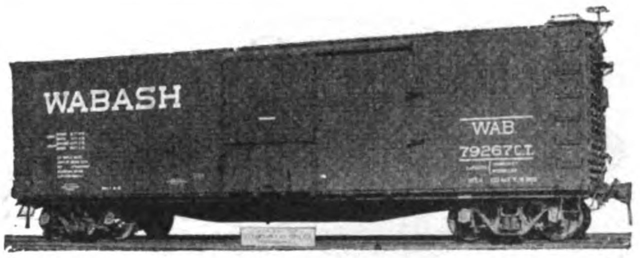

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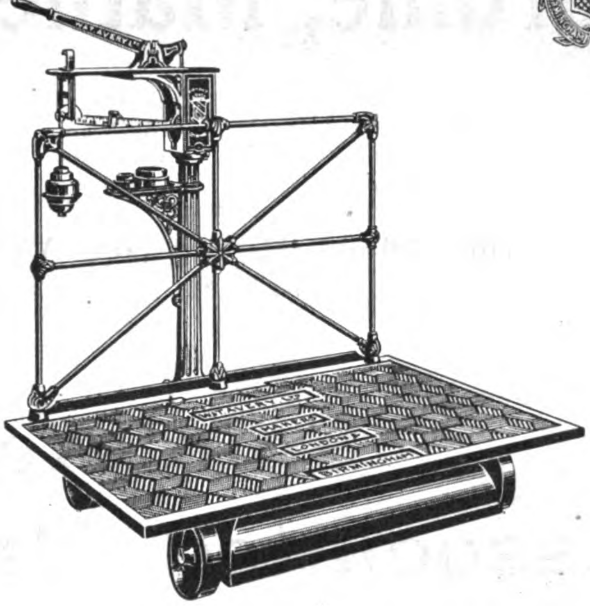

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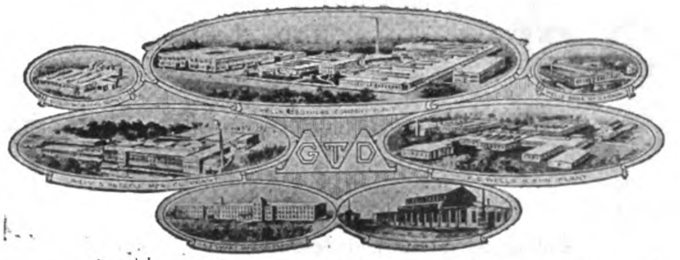

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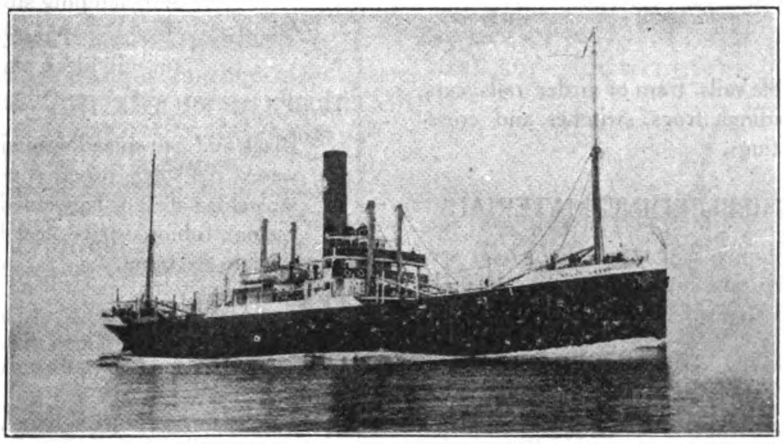

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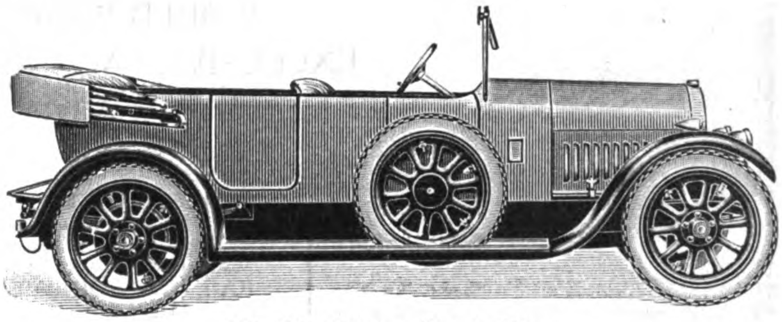

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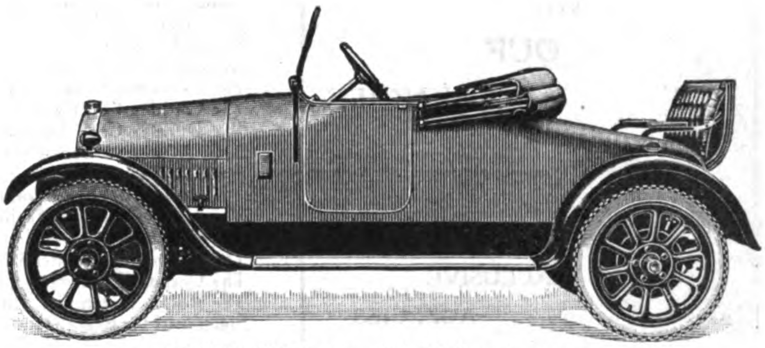

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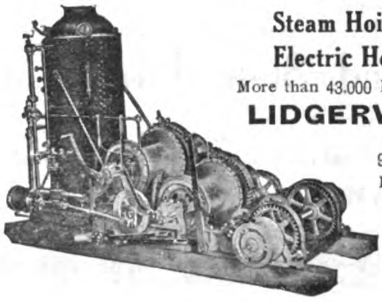

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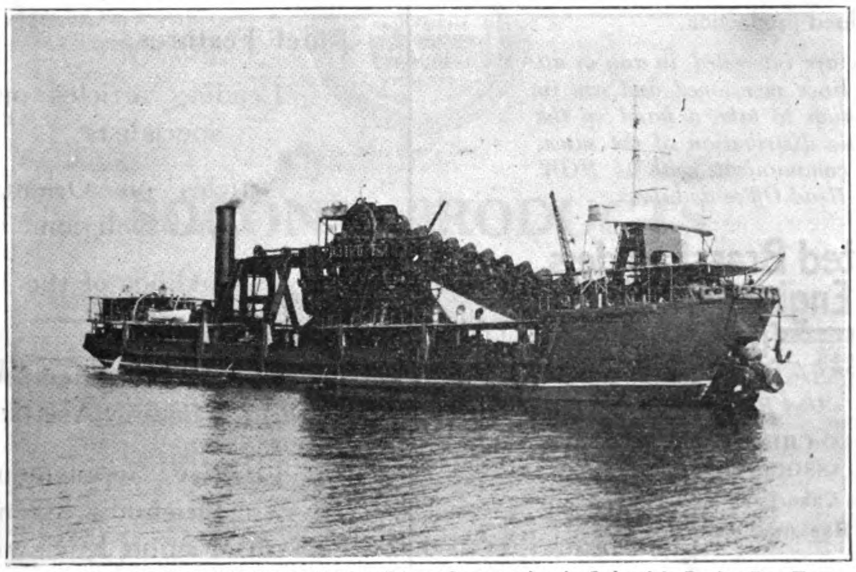

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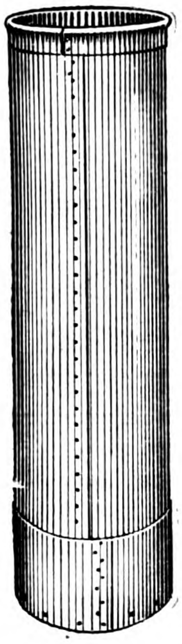

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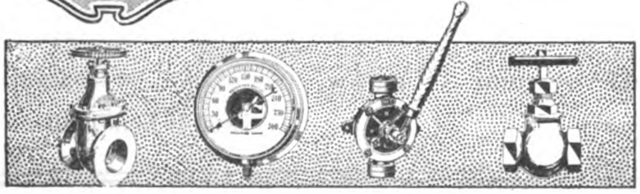

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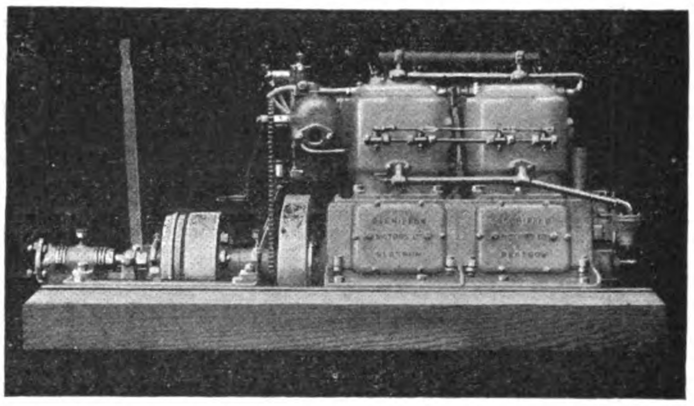

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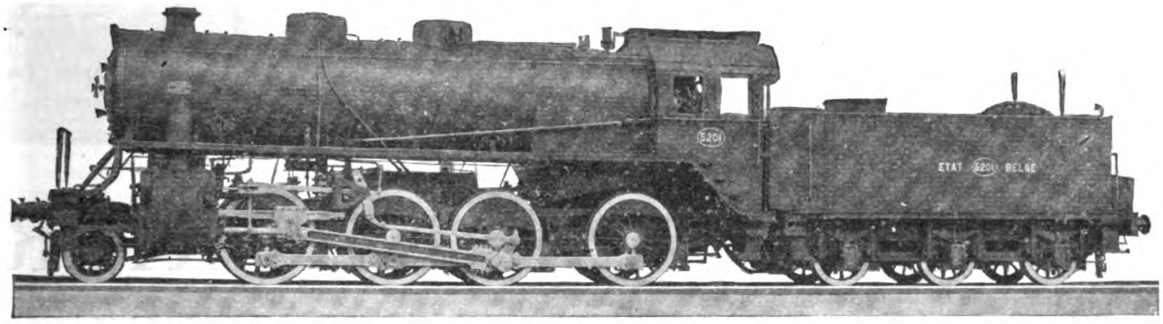

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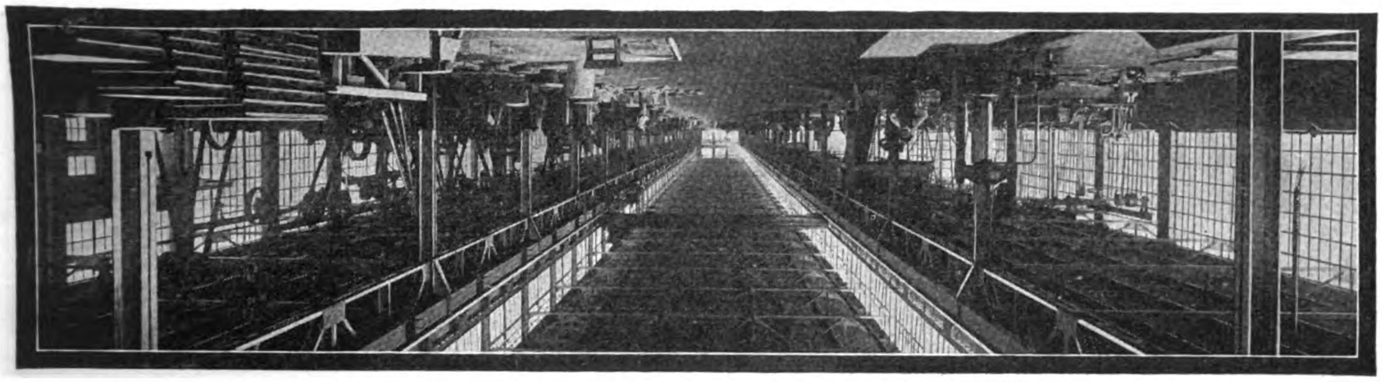

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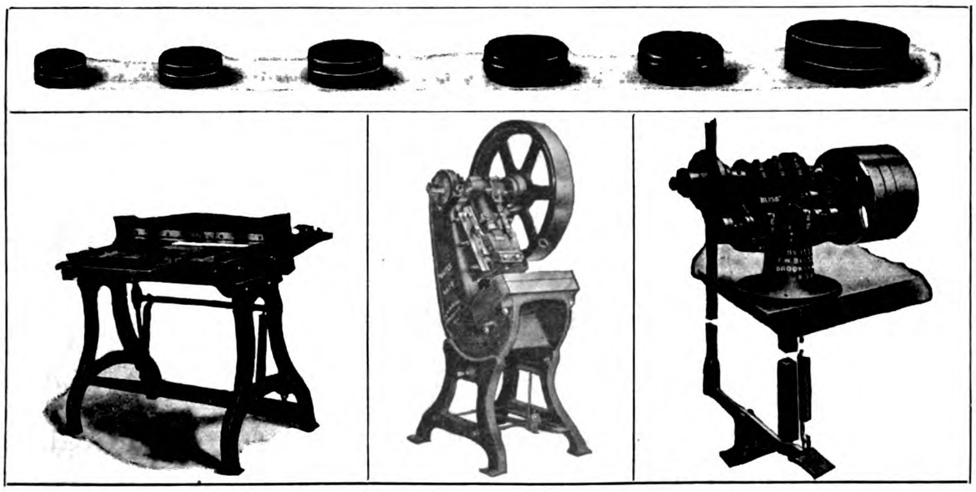

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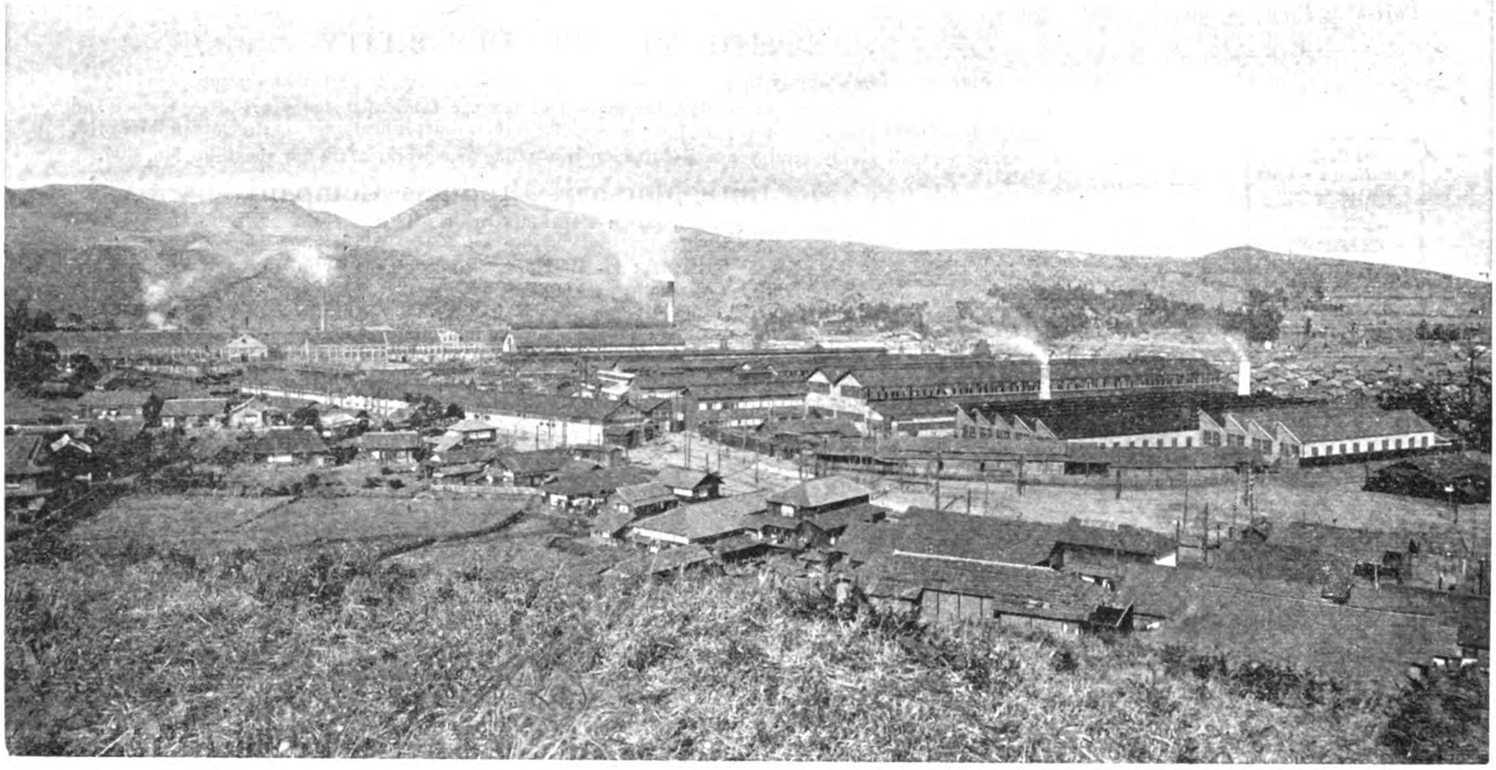

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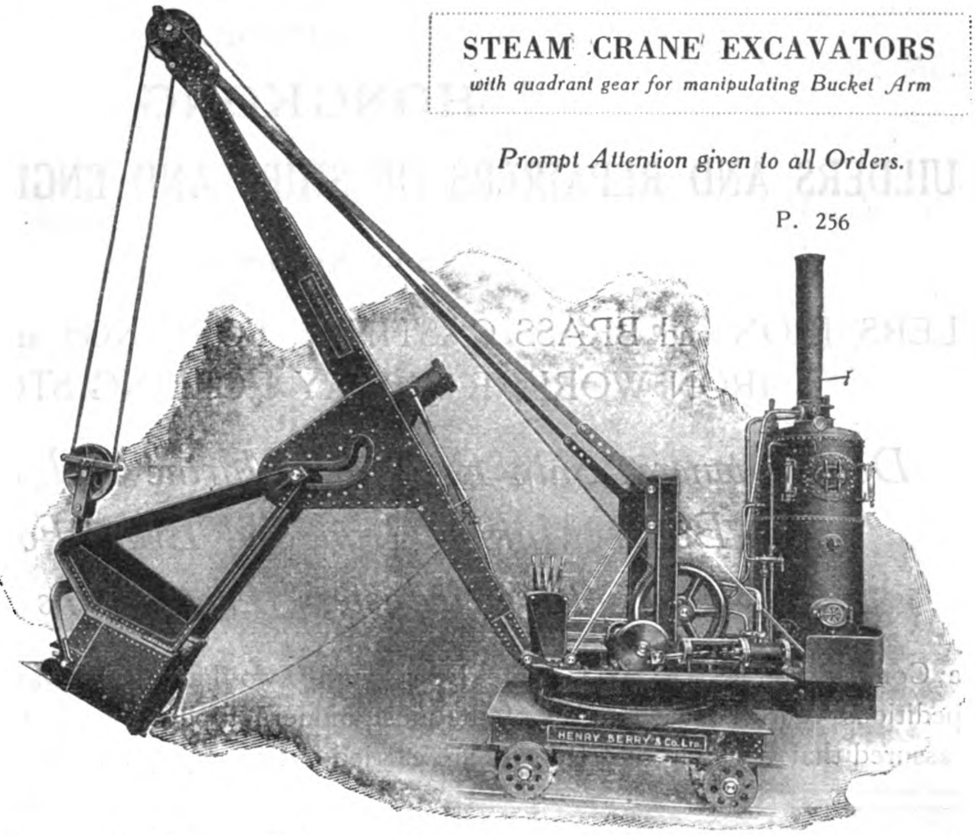

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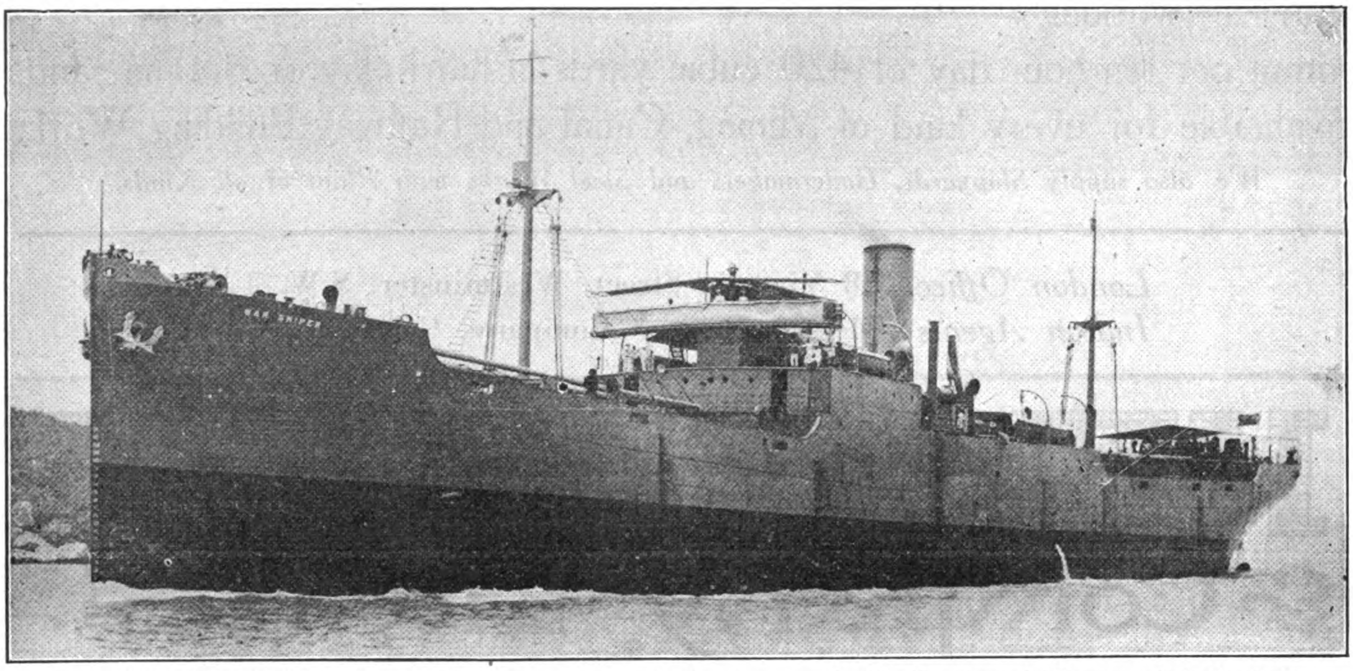

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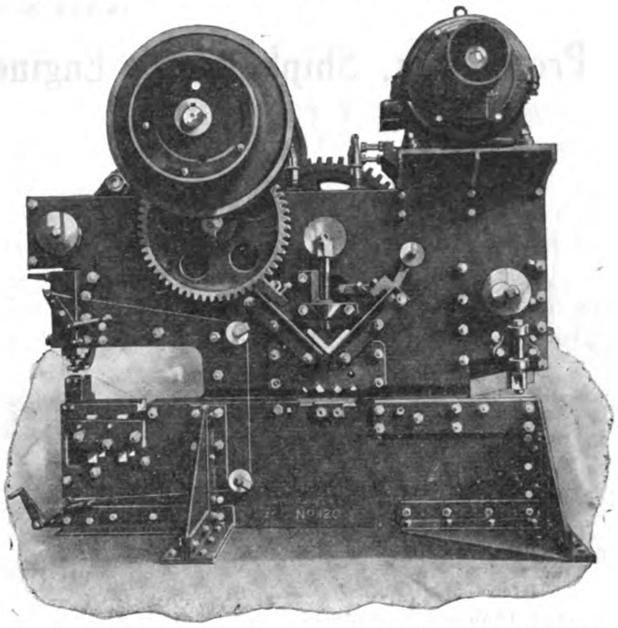

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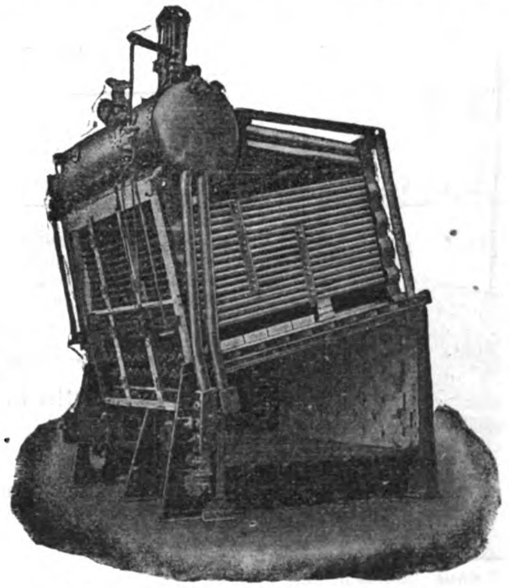

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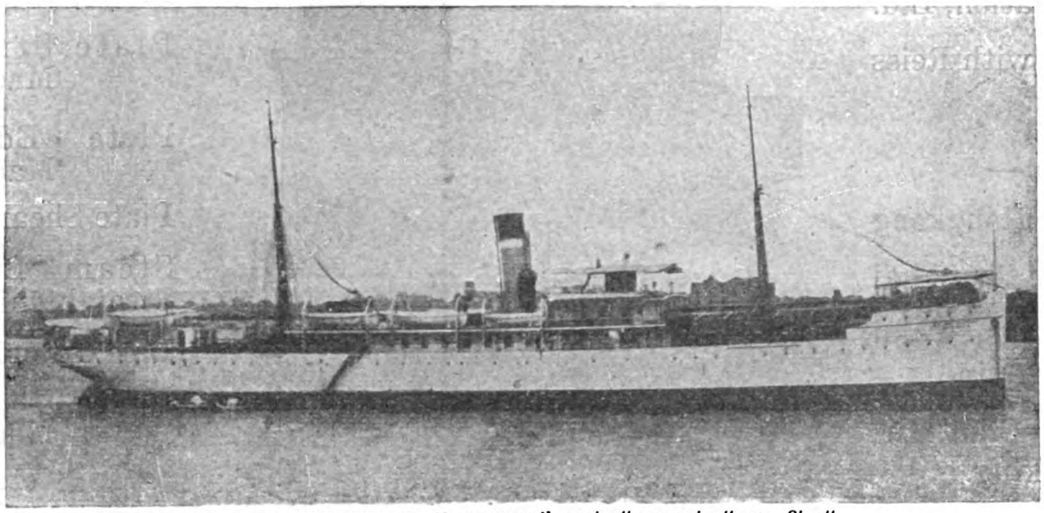

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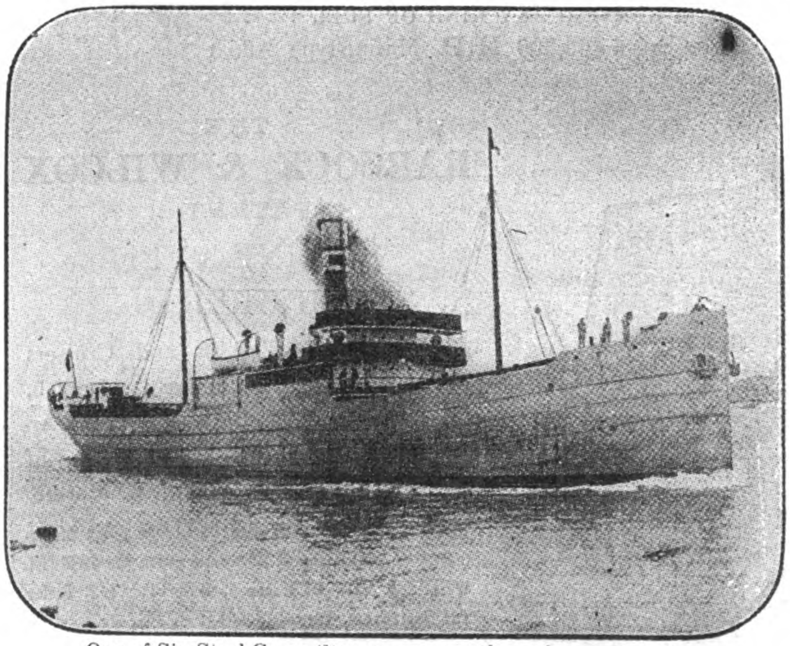

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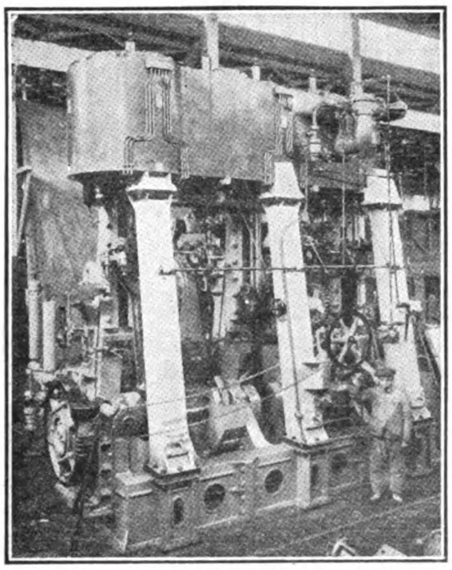

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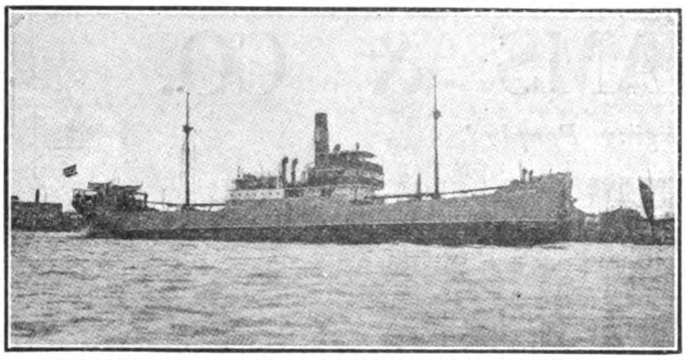

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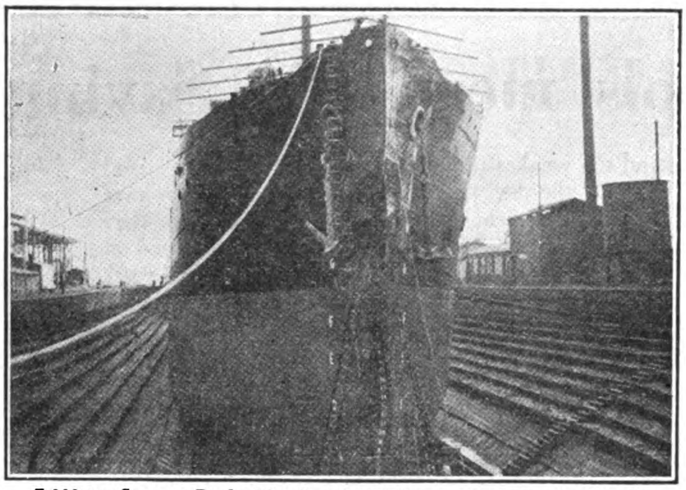

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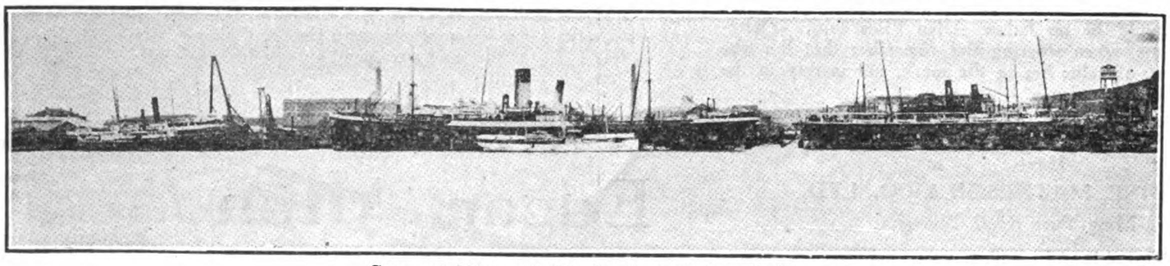

General View of Works from River Side

Showing 8 Steamers Berthed Alongside Undergoing Repairs.

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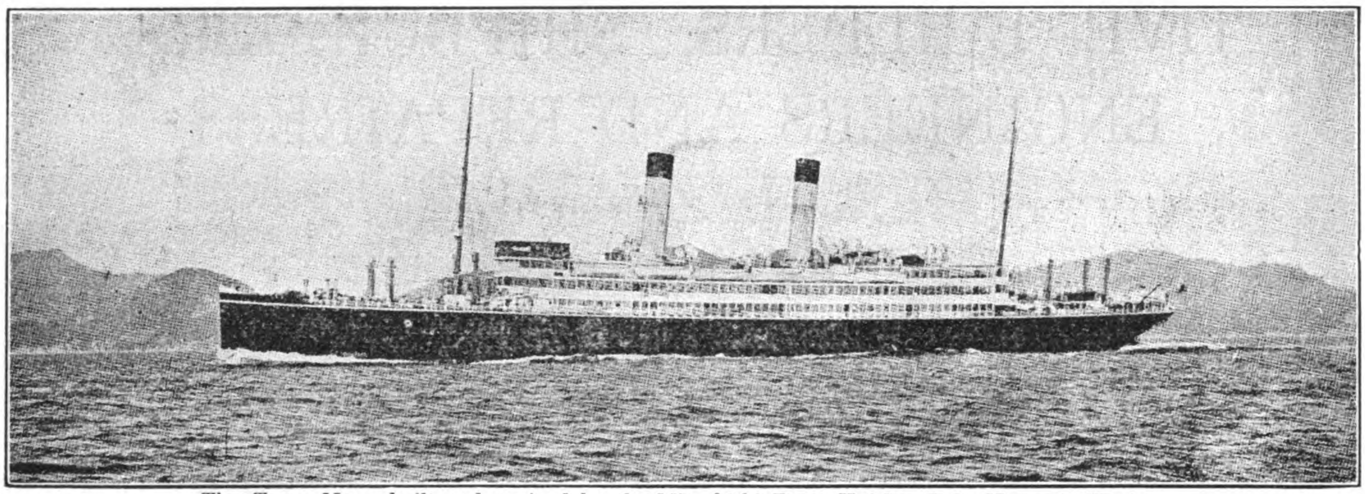

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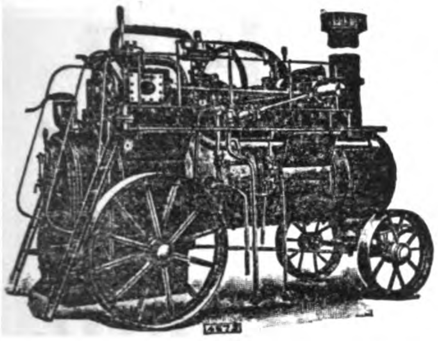

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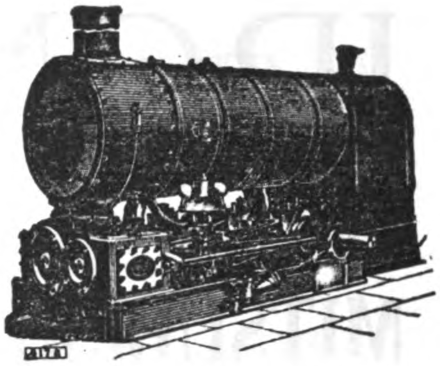

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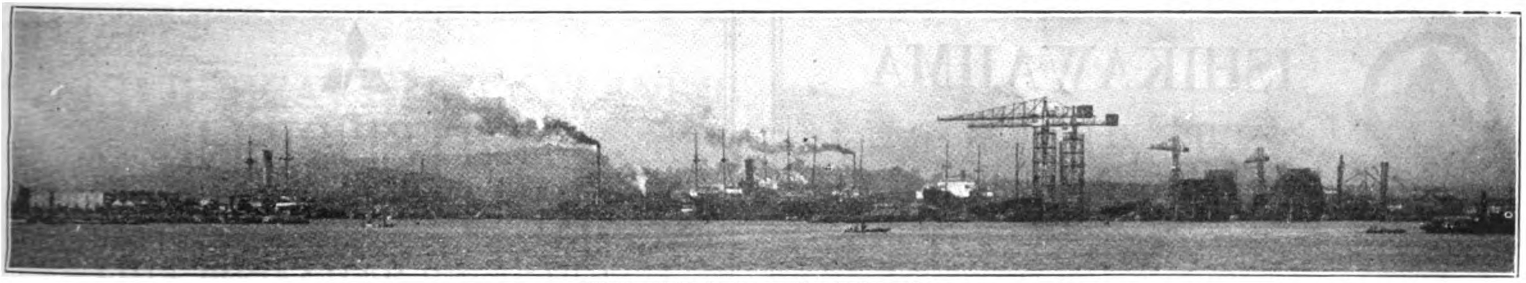

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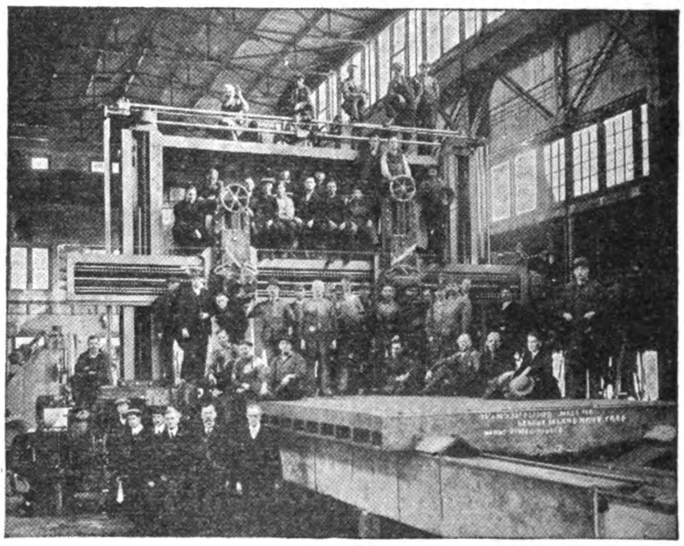

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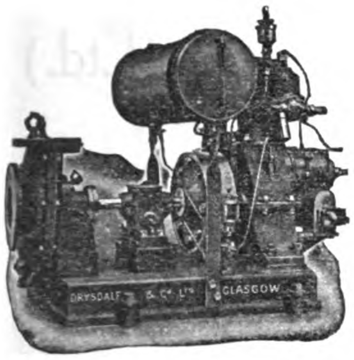

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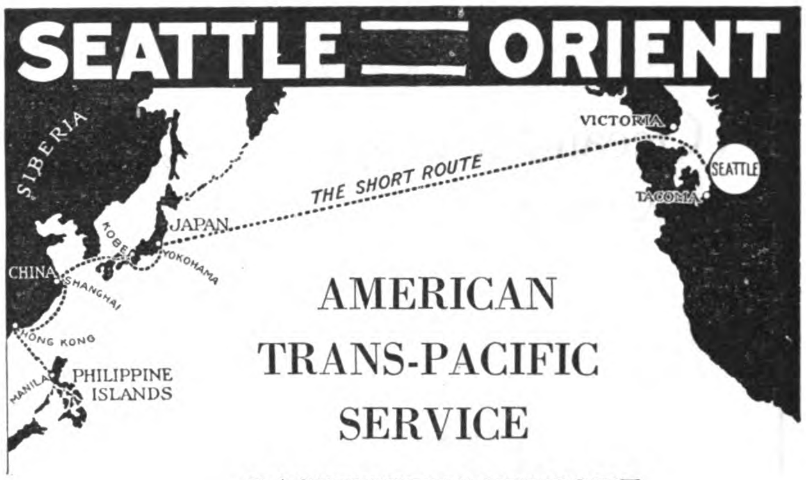

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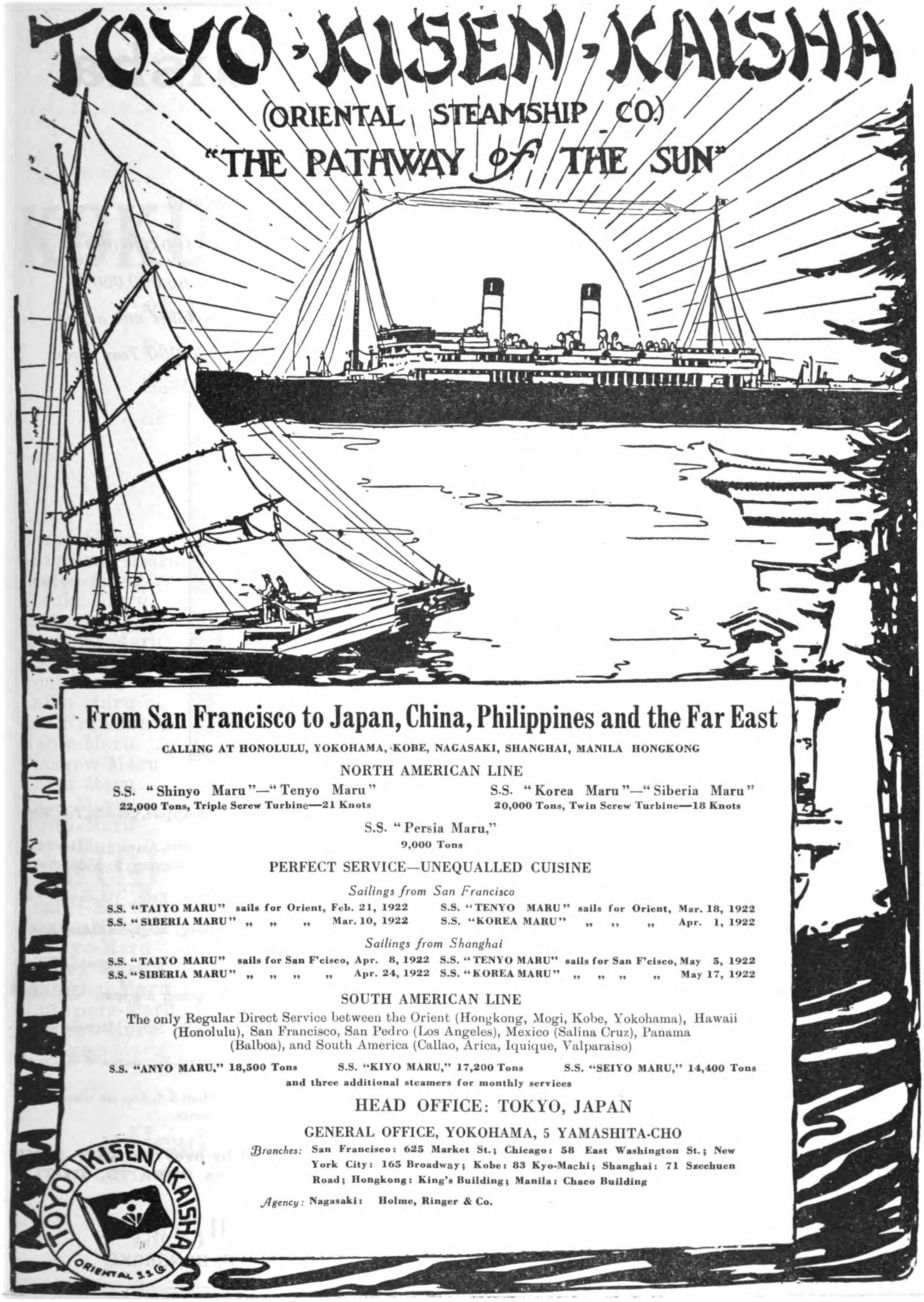
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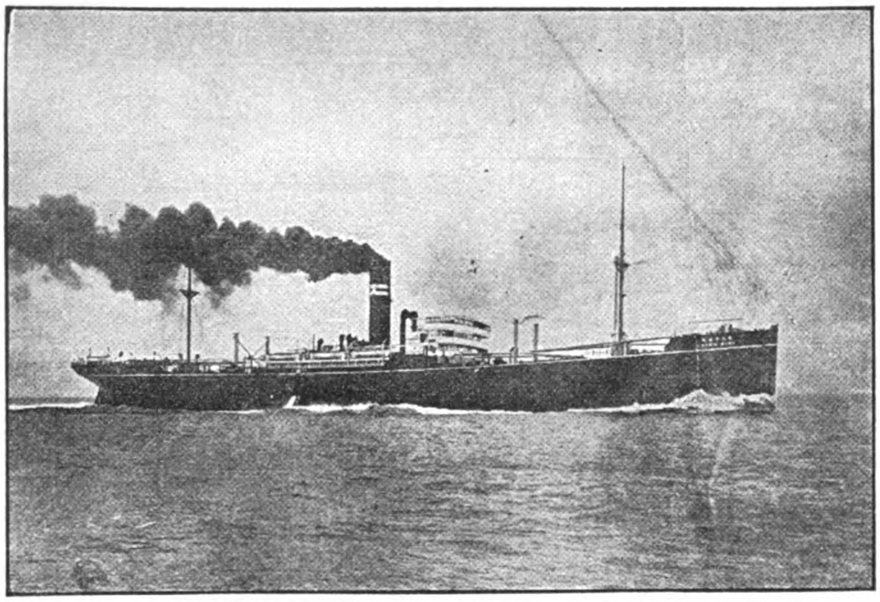

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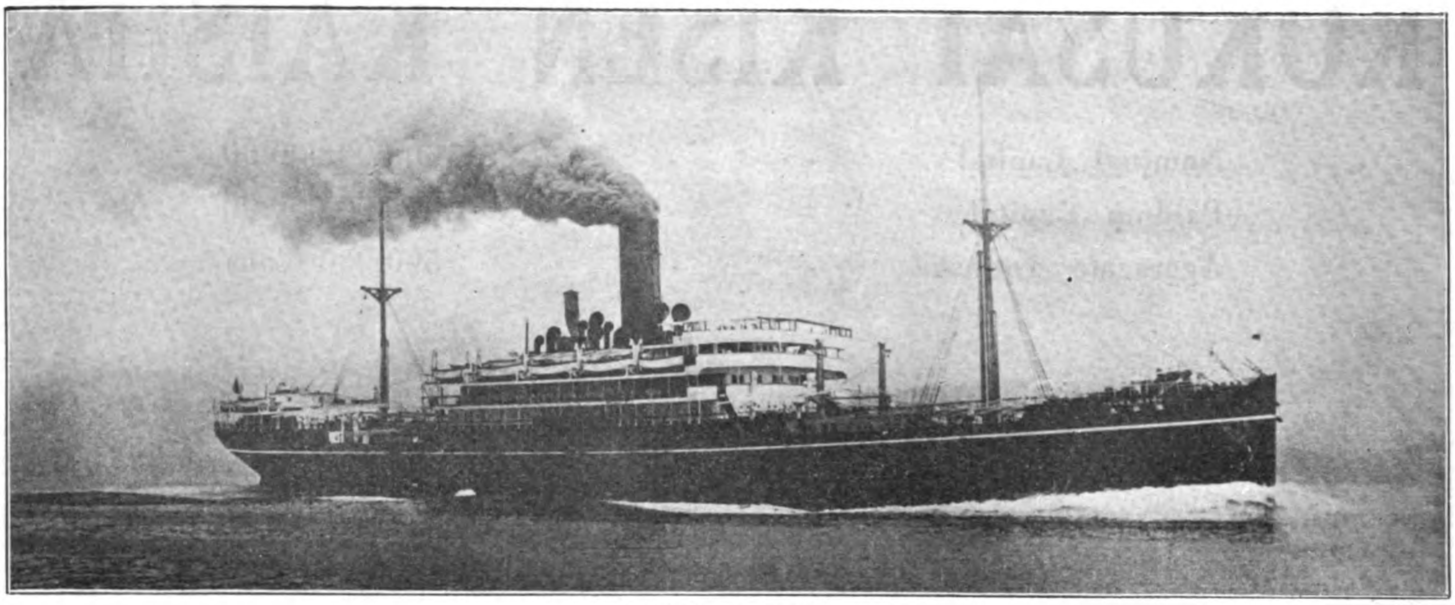

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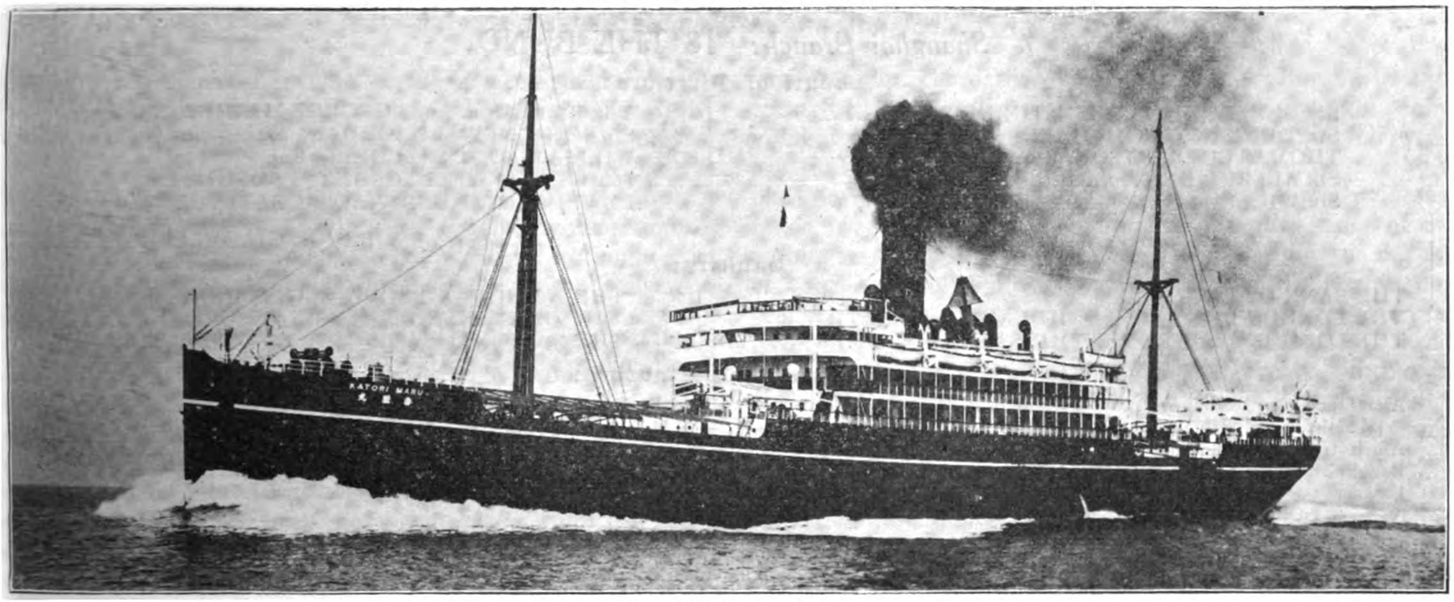

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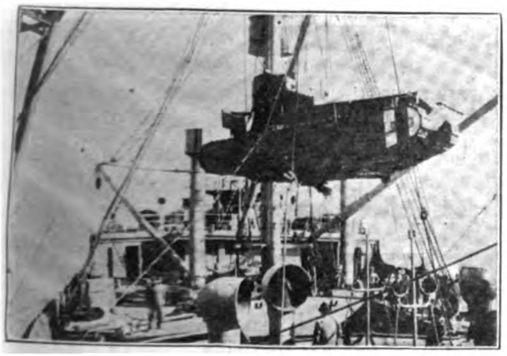

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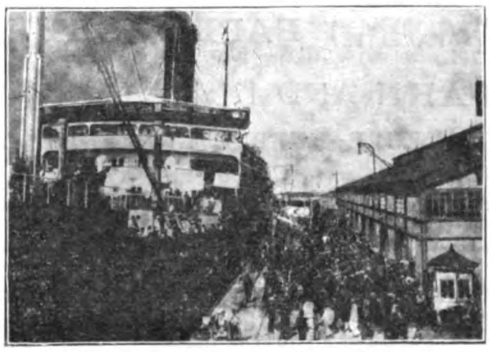

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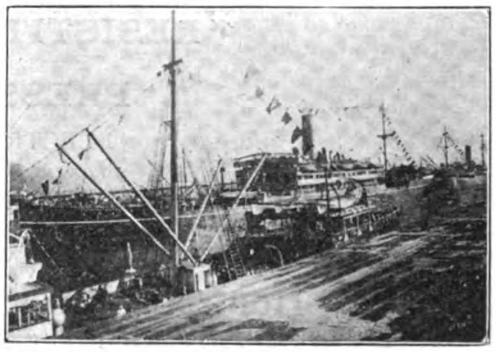

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The Far Eastern Review

ENGINEERING FINANCE COMMERCE

VOL. XVIII SHANGHAI, JANUARY, 1922 No. 1

The Market for Motor Vehicles in China

By Geo. Bronson Rea

THAT China offers one of the greatest fields for the expansion of motor traffic is being emphasized by the wide-spread demand for good roads, the organization of companies for their construction and the orders that have been placed for motor vehicles. A review of the market discloses an unusual activity in all sections of the vast country in opening up new communications for commercial and military purposes. While it is too early to say that road building in China has been taken up in that serious frame of mind that impels other peoples to gridiron their lands with arteries of communication, it may be said that a good beginning has been made, and, if funds can be found for continuous construction and maintenance, the future holds bright for the development of a huge market for motor vehicles of all kinds. This phase of China's development can be traced largely to the fact that for eight years, railway construction has been practically at a standstill, with very little hope that funds on a large scale will be forthcoming from abroad for the resumption of work. Cities and towns in the interior, which cannot hope to be connected by rail, are turning their attention to the cheaper method of road communication, which calls for little more than the use of the over-abundant local labor in grading, rolling and, in some cases, of breaking stone.

These encouraging signs are also traceable to the excellent campaign being carried on by the good roads movement in the interior. Could capital be more readily obtained for road-making purposes, a boom in the automobile trade would follow. Unfortunately, there is little security for foreign capital in such enterprises, other than that supplied by the central or provincial governments, and such advances would have to come under the scope of the consortium. The delays in arriving at some understanding whereby this international financial combination can come to the assistance of China, eliminates this method of financing the construction of new roads, and throws the burden upon private Chinese initiative.

It speaks well for the enterprise of the Chinese that many private road and auto-transportation companies have been formed, or are in process of promotion. Some of these schemes, like those in the Shanghai district, are of great importance calling for large sums to swing them. It also augurs well for their success that they are largely private enterprises controlled by the merchants who expect to derive their profits and maintenance costs from the operation of motor vehicles. Up to the present, aside from the service across Mongolia, the government seems to have left this field open to private initiative, and even after constructing highways at its own expense (as in the case of the Chefoo-Weihsien highway) has thrown the roads open to private companies who pay for the franchise to operate auto-transportation services.

If ways could be found for foreign capital to assist in this development through taking up the securities of the stronger native banks a great impetus would be given to the automobile trade with China. It would seem that here is a field that the many sino-foreign banks (as distinguished from those embraced in the consortium) could exploit to advantage. Although a review of the market for motor vehicles is highly encouraging, we would not have it thought that we are predicting an immediate boom. Far from it. All the elements are here, however, for a rapid development depending entirely upon the extension of new roads. It may be taken for granted that wherever such a road is built connecting one town or village with another, the automobile and truck will follow. Whatever aid or financial encouragement can be extended by foreign banks or investors to the Chinese banks who directly finance these roads, is so much capital contributed to the expansion of the automobile trade. All the elements are also here for the development of a business that will carry with it the old familiar clause giving preferential treatment to the nation supplying the necessary financial assistance. The struggle for the Chinese automobile trade will undoubtedly revive the system of financing roads, on the condition that certain types of automobiles or trucks are purchased; purely private engagements between banks, in which the government cannot interfere, or other nations claim that the door is being closed to them.

Notwithstanding the risks involved in financing enterprises over which no control can be exercised, we incline to the belief that these would be largely eliminated through foreign financial co-operation with the more important native banks, who would see to it that their interests were fully protected. Otherwise, left to purely native initiative and capital, the demand for motor vehicles will fall far short of foreign expectations. The competition for the sale of cars and trucks in China as the field widens, will undoubtedly pave the way for some measure of foreign financial co-operation with the Chinese banks, to ensure that orders for cars will be placed in the country furnishing the financial assistance. If American, British, French, German, Japanese, Norwegian and other capital can co-operate harmoniously and profitably with Chinese in the conduct of banking in China, it would seem that these institutions might assist in providing the much needed capital required for the construction of new roads and expanding the automobile trade in China. The field is wide and important enough for the creation of a special sino-foreign bank working in with the leading Chinese financial institutions to specialize in these securities. A most important highway is now being surveyed between Chengtu and Chungking in Szechuan, which we assume would be facilitated by financial assistance in the shape of long-time debentures. While it would be out of the question for foreign investors to hazard their money direct in such an enterprise, yet if these road bonds were issued through the Young Brothers Banking Corporation of Chungking, the strongest financial institution in Szechuan, it would seem that a way would be opened for foreign banks or sino-foreign banks to handle their securities. Nothing would contribute more to the advancement of trade in China than the building of highways in Szechuan, as for many years to come, the much-talked-of railway into this province must remain on paper. Roads that will permit the produce of this rich province to reach the Yangtze and be transhipped to the fleet of shallow draft steamers plying between the river ports and Ichang, constitutes the only immediate hope of opening up this province.

The importance of the Far Eastern market has been brought home to the American manufacturers of automobiles and the department of commerce is sending out to China a special automobile expert to study the conditions here and aid American manufacturers to increase their exports. The decision was reached by the commerce department in the middle of Novem-

ber to send the commissioner to foreign countries for surveys of automobile markets and help American builders who must have world-wide markets for their full-time operations. The commissioner, Mr. William I. Irvine, will sail from San Francisco on January 12.

The value of the China market is seen in the recent report of the British commercial attaché at Peking who says that "Motor cars to the value of over one million sterling were imported into China in 1920. The bulk of these cars came from the United States, but British cars are being seen in increasing numbers in the streets of Shanghai and other large towns. Unfortunately the cheapest British cars that come to China are far more costly than American cars of similar model and power, and, unless some drastic reduction in the price of British cars can be effected, Mr. Fox does not see any hope of their being able to compete successfully in the market."

"It must be remembered that as there are as yet no good roads in China, cars are chiefly used for town work, and there is no doubt at all that for crowded traffic and narrow streets with sharp turnings the American car is far more suitable than the British vehicle. When the roads in China permit of making long-distance runs, and when ability to climb hills is a factor that counts, then no doubt the British car will come into its own.

"In the meantime it is satisfactory to note that British motor-car manufacturers have begun to realize the possibilities of the China market and that several of our leading makers have recently concluded agency agreements with local garages. Motor trucks and lorries are coming into general use for transport purposes, and there should be a great future for this class of vehicle in China."

Further comment on the automobile trade in China appeared in *Finance and Commerce*: "China's last year's importation of motor cars amounted to the respectable figure of Haikwan Tls. 3,447,219, of which America supplied cars to the value of Tls. 2,191,664, Great Britain just a quarter of America's total, and Japan (re-exportations of foreign-built cars) just half of Great Britain's total, with Canada's share standing at Tls. 390,000. This is a remarkable showing. That China should import less than 3½ million taels worth of motor cars in a year when her total import trade was just less than Tls. 780,000,000 is perhaps not startling, but to those who know the conditions in this country it is a portent of the most striking development in motor-car distribution. For it must be remembered that China has not been a big buyer of motor cars until the last year or two. In 1912 her total purchases were valued at about a quarter million taels (of which Shanghai took two-thirds). In 1914 the total purchases did not amount to more than half a million taels. By 1918 it had risen to 1.3 million taels, so that it can be seen that only during the last two years has there been any rapid growth. Shanghai, of course, has always been the biggest buyer. Last year her share of the trade was Tls. 1,782,934 (compared with Tls. 589,877 in 1918), and Tientsin (whose purchases in 1912 were only Tls. 58,000, and in 1918 only Tls. 397,000) bought in 1920 cars to the value of Tls. 1,140,750. If one can imagine an inter-provincial network of macadamized high roads in China, the mind staggers at the probable number of cars that might be sold in this country during a decade. It must be said to America's credit, says the journal, that her agents are aggressive in "beating up prospects," and it is questionable whether the American car can be competed with on price. But it does seem a pity that British manufacturers are not alive to the great headway that motor car traffic is making in this country."

The table appended shows the number and value of automobiles and motor trucks imported into Shanghai for the years 1912 to 1920:

AUTOMOBILES AND MOTOR TRUCKS IMPORTED INTO SHANGHAI, CHINA, 1912-1920

Year	Number	Gross and Value in Gold Dollars	Year	Number	Gross and Value in Gold Dollars
1912	116	118,495	1917	504	481,485
1913	162	205,600	1918	700	954,261
1914	217	278,996	1919	961	*1,491,741
1915	169	183,694	1920	1,397	*1,938,944
1916	350	371,732			

*Net value.

The review of road construction in China, commencing on the next page, compiled from the latest authentic and official sources, will help to give some idea of the increasing value of this market and the need for adequate support to the good roads movement facilitating its expansion. This survey is not complete, as limitations of space compel the omission of many items of interest connected with modern road construction and the establishment of motor transportation companies.

To Sianfu by Autobus

WHAT promises to be one of the most important transportation enterprises in China has been organized by Shensi merchants under the name of the Si Tang Motor Service Company, which will operate buses from Shenchow in Honan, to Sianfu, the capital of Shensi, a distance of 470 *li* (156 miles). The funds for the construction of the road and the purchase of automobiles is now being subscribed. It is estimated that $500,000 will be required. Perhaps there is not another road in China that witnesses such heavy traffic as this main artery between Sianfu and the Yellow River town of Shenchow. Along its route is borne the trade of northwest China and a large part of that of Tibet. Some idea of the traffic may be gleaned from Mr. Eric Teachman's description of a trip made over the existing road four years ago in his recent book, "Travels in Northwest China." Speaking of the railway trucks on the Peinlo line, which terminated at that time at Kuanyintang, he said "the sight of the swarms of Chinese packed into the string of open trucks running backward and forwards on this incomplete section testifies to the popularity of railway travel on this road and to the number of travelers." "The traffic on the road from Shenchow on is immense, and an almost constant stream of carts and pack mules laden mostly with cotton and hides on their way from Shensi to the coast, is met."

The traffic on the roads of the fertile and populous Wei River plain is very great, and it is one of the absurdities of modern China that no railway should as yet connect Sianfu, the metropolis of the northwest, with the coast. Railway construction on the plains of central Shensi means little more than laying the rails on the necessary embankment and building a number of small bridges across the streams which flow down from the Ch'ingling Shan into the Wei River . . . Failing railways, the construction of a few good trunk roads fit for motor traffic would be of enormous advantage to the province and could be undertaken, as far as the plains of Central Shensi are concerned, at comparatively small cost."

From this short description, it would seem that the company now being promoted by the merchants of Shensi has a brilliant future ahead of it.

* * *

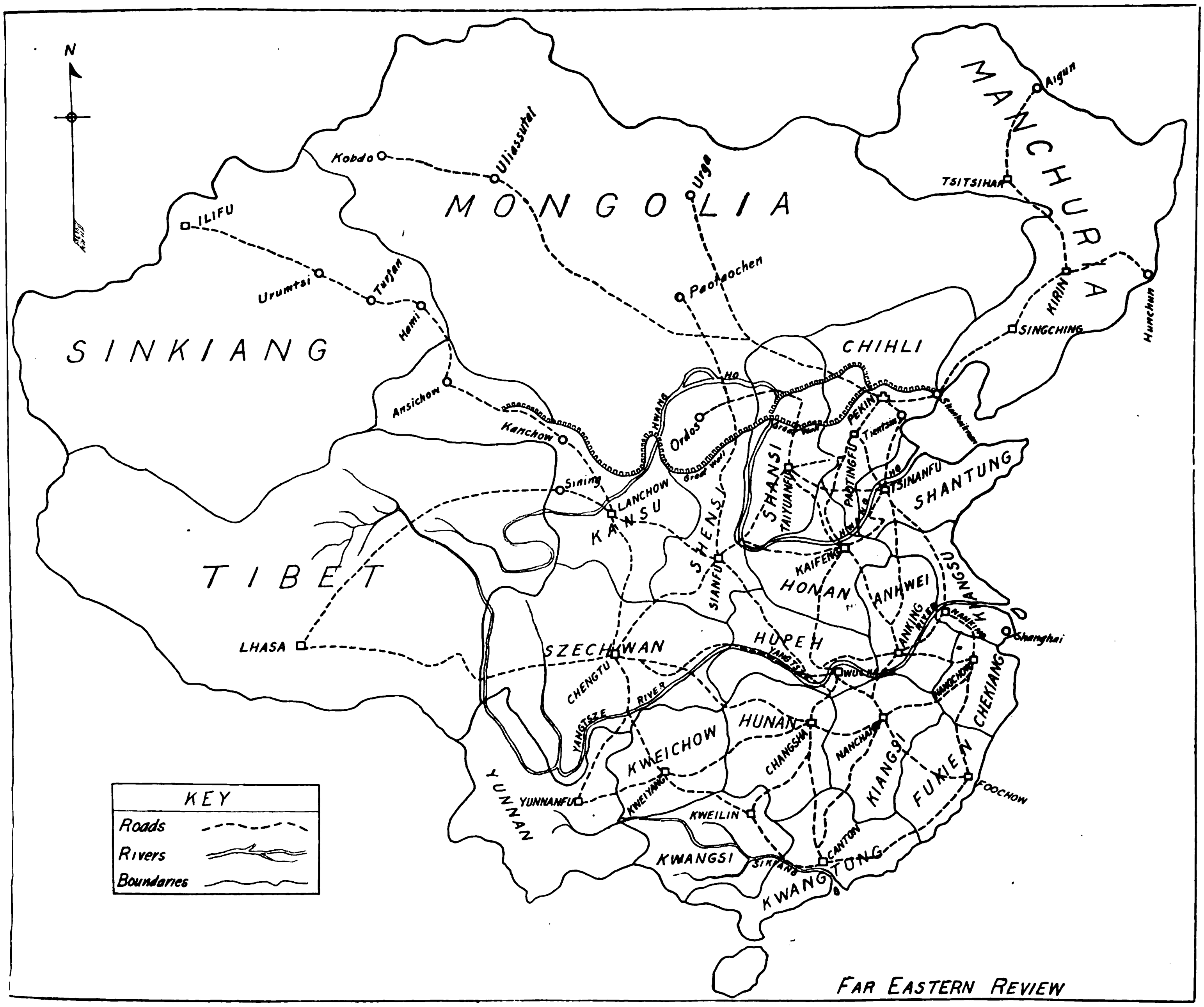
The Chin Chih Chen Communications Society of Ningpo propose to organize a long-distance automobile company.

* * *

Traffic has started from the Ta Da Wharf, Nantungchow to Tau Hua Oo. The roads office runs an automobile service for the transportation of goods and passengers at moderate fares.

* * *

Wang Ling-ke, owner of the Heng Feng Native Bank of Wuhu and others, are planning to establish a long-distance automobile service to run between Wuhu and Hsuanchen. They are also planning to construct good roads.



Suggested National Highway System for China designed by Mr. P. T. Chow, Road Expert in the Ministry of Interior, Peking. Mr. Chow's Scheme called for 51 National Highways having an Aggregate Length of 30,823 Miles, to cost about $10,800 Mexican per Mile, or a total of $332,878,000, Spread over a Period of Ten Years

Modern Roads and Motor Vehicle Transportation in China

IT seems but yesterday when THE FAR EASTERN REVIEW took the initiative in 1914 in the movement for modern roads in China and through its editor, Mr. W. H. Donald, influenced the Peking authorities to enter into a contract with an American syndicate headed by a Detroit automobile manufacturer to build a highway leading out from Peking. Although nothing came of this original venture, the necessity for good roads, if only for mandarin joyriding, was brought home to the Peking authorities, and little by little the streets of the capital and the main roads leading out to the immediate suburbs were macadamized and made safe for motor traffic. Since then, many miles of excellent highways have been constructed around Peking, bringing the Western Hills, Nanyuan and Tungchow within easy reach of the capital by motor. From the few cars owned by the highest officials a few years back, the capital now has 1,308 motor cars, of which 32 are owned by the government, 45 by the diplomatic corps and the remainder by individuals and the garages, an increase over the preceding year of sixty-six per cent. In these figures some idea can be gained of what the future holds out as other large Chinese cities are furnished with good roads. It is difficult to designate any particular Chinese official as the father of good roads as many have since taken up the movement and shoved it ahead until at present it is nation-wide, supported by an organization with headquarters in Shanghai. It may be said, however, that the original advocate of a nation-wide system of highways was Mr. Lo Kou-shui, one of China's foremost foreign-

trained engineers, of the old group of students who went to America in the early eighties and graduated from the Troy Polytechic Institute. While acting as technical secretary and adviser to the ministry of communications in 1913, Mr. Lo strenuously urged the adoption of a highway program as a complement to the construction of a national system of railways then being drawn up. He pointed out that any large investment in new railways would fail to bring adequate returns unless feeders in the form of modern roads were constructed to permit the produce of the tributary districts being cheaply transported to the railway. Mr. Lo's recommendations, however, received little favor because of the fact that the cost of highway construction would have to be borne by the central and provincial governments, while railways could be financed by foreign loans, with considerable profit to the officials concerned. Road building in China buttered no official bread.

Mr. Lo's recommendations still hold good and should be given most careful attention when conditions again permit foreign bankers to take up the question of financing railways in China. If the railways are to pay, the highways must be built to serve as feeders. A national program for railway construction should include provision for a definite highway system.

The seeds sown by Mr. Lo Kou-shui found root in Peking and various other officials of the government have since urged the adoption of a fixed program for a national highway system. Foremost amongst these was Mr. P. T. Chow, road expert in the ministry of the interior, who drew up an excellent program aggregating over 30,000 miles of new roads, calling for the construction of about 3,000 miles the first year at an average cost of $10,800 silver per mile, an excessive estimate when compared with subsequent working costs as obtained by the American Red Cross, averaging $1,800 per mile for earth, and $4,000 per mile for macadam roads. However, the costs obtained by the Red Cross under famine conditions cannot be taken as normal.

Government Road Regulations. – The constant hammering upon the Peking authorities to place such a scheme into practice finally resulted in a presidential mandate being promulgated on November 15th, 1919, laying down regulations for the construction of new roads. These regulations, drafted in the ministry of the interior by the road experts, consisted of 15 articles, the essential points in which are as follows :

"Highways are to be classified under four heads—national, provincial, *hsien* (district), and village highways.

"The national highways are to be those between the capital (Peking) and the provinces, or special administrative areas; between the capital cities of two different provinces, and between strategical points, harbors and other places of military importance. The width of a national highway is to be 50 feet (Chinese), or more.

"Provincial highways embrace those between the capital city of the province and the different *hsien* cities under its jurisdiction; between different *hsien* cities; and between railway, mining, commercial and industrial centres, and places of military importance within a province. The width is to be at least 30 feet.

"The *hsien* highways are to be those between the *hsien* cities and the rural districts under its jurisdiction; those connecting the different rural districts of a *hsien*; and those connecting a *hsien* city with river or sea ports, or railway, mining or industrial centres in the neighborhood. The width of *hsien* roads is to be 24 feet or more.

"Village highways are to be those between different villages, those connecting the villages with schools, factories and other public works in the neighborhood. The width of these roads is to be decided by the public bodies of the centres concerned.

"National highways are to be designed by the ministry of the interior. Provincial highways are to be designed by the highest provincial officials concerned, who will, however, have to submit their plans to the ministry of the interior, which will also decide what sections are to be built, and the time in which they are to be completed. The ministry of the interior reserves to itself the right to create special organs for the construction of national highways under its direct control.

"The *hsien* highways are to be planned by the district magistrates who are to submit their proposals to the provincial authorities. The work of construction is to be carried out under the direction of the magistrates, together with the local self-governing bodies of the districts.

"The width of bridges over canals or creeks is to be fixed according to the width of the type of highway."

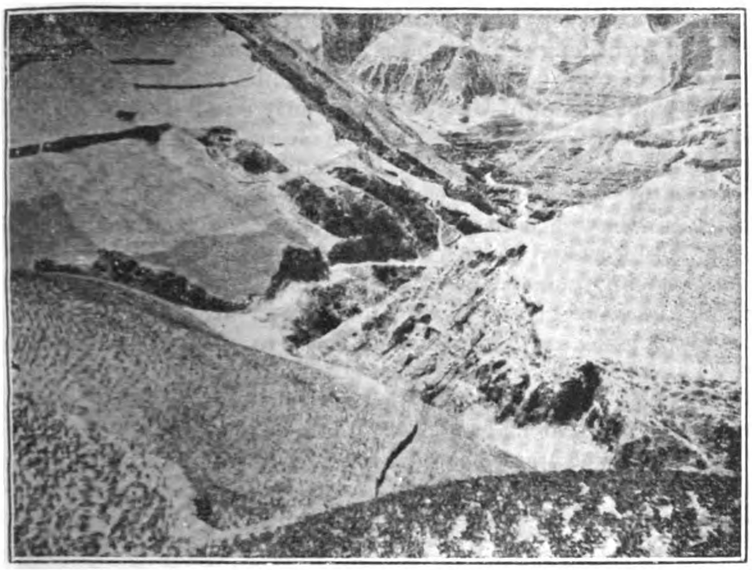
Experience seemed to place these regulations on a par with all others that have flowed out from Peking in a constant stream since the establishment of the republic, but the increasing love of motor car riding on the part of the officials, high and low, assured for them a reception that held out high hopes that they would be carried out. Official activities were spurred on in the north by the various automobile associations, sales agents and others, each with a different motive. The red cross society became active in road work to provide employment for famine and flood sufferers, automobile agents and clubs had their eye on business, the military leaders wanted them in order to move troops rapidly, and others simply desired smooth roads leading anywhere for the sake of pleasure. The same influences are now assuring the construction of roads in all other parts of China, but to the above motives is added the more important one of seeking adequate means of cheap transportation in districts outside the railway zones. We are now witnessing, under the stimulus of the good roads movement and others, the picture of the Chinese authorities being moved from below, the initiative coming from the merchants rather than from the government. On all sides we hear of new road building companies whose ultimate object is to provide automobile transportation to districts now isolated and stagnating because of inadequate means of communication. Under the stimulus of profits for the promotors, squeeze for officials and revenue for the central and provincial treasuries, the Chinese have found the key to the rapid development of highways and its resultant business in automobiles and trucks. Companies are being organized in all parts of the country to build roads and operate autobus services, but the ministry of the interior must first give its sanction and the company must file its application for registration and permit to function with the ministry of agriculture and commerce, in addition to obtaining permits from the local authorities. So here we find a combination of conditions which brings the authorities and business interests into harmonious relations that is resulting in benefits to the people and to foreign manufacturers who have road-making machinery, tools and automobiles to sell.

Aside altogether from the good work of the good roads movement, the greatest impetus given to road building and automobile transportation in North China arose from the famine relief activities of the American and other national red cross societies last winter, when over 856 miles of new roads were built and turned over to the Chinese authorities by the American red cross alone. This was supplemented by the activities of the ministry of communications, notably in the building of the Chefoo-Weihsien road in Shantung, and now nearing completion. The government recently issued invitations to the public for tenders for the right to use the road for autobus services, the recepits from such franchises to be paid into a fund for road maintenance. Branches from this main highway are to be constructed that will open up the entire northeastern part of Shantung.

North China Roads.—It is, however, in North China that the most progress has been made to date in road construction, where we find the road between Tungchow and Tientsin well under way. A road between Tientsin and Paotingfu, the two capitals of Chihli province, has been built by the military governor, but will have to be reconstructed before it is fit for use by motors. An article dealing with the red cross roads in North China appeared in the October number of THE FAR EASTERN REVIEW. We reproduce the map which shows these roads and the wells sunk in Chihli.

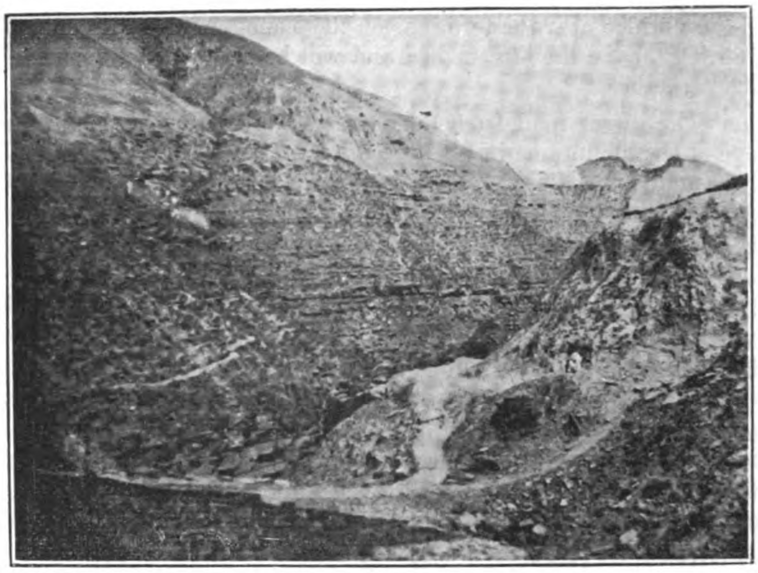
Peking-Tientsin Highway

This road has received more publicity perhaps than any other similar enterprise in China and it has been difficult at times to follow its financing, its route and progress of the work. It was first proposed in 1917 by the American flood relief committee under the leadership of Minister Reinsch and Roger S. Green of the Rockefeller foundation. The American red cross offered to contribute $100,000, if the Chinese would give an equal amount. The red cross money was to be used for the payment of flood-sufferers as laborers on the construction of the road. The Chinese share was to come in materials and the Chinese government was to



Looking down to the Valley towards Jung Tu from top of the Pass (Le Ja Wan)

SHANSI ROADS



Looking down towards Jung Tu from the old Trail

arrange the right of way. Due to political conditions in China, only the first section of the road from Peking to Tungchow was completed. The work of building was managed first by R. A. White of Frazar & Company and later by Capt. McDonnell of the 15th infantry, U. S. A.

For the completion of the road from Tungchow through to Tientsin a loan of $250,000 was entered into in June of 1919 between the metropolitan bureau and the Banque Industrielle de Chine. The total distance is estimated at 98 kilometres, 12 metres wide. The agreement called for a hard earth or sand road, the surface maintained by steam rollers. In addition to the above sum to be used entirely for the purchase of land and general construction work, a further sum of $400,000 was allocated to the road fund from the 1914 Pukow port development loan between the Chinese government and the same bank. The construction of this road has proceeded spasmodically, until it has reached Yangtsun, within a few miles of Tientsin. And here it stops for the present because the police commissioner of Tientsin has prohibited further work, arresting and throwing into jail a foreman and a gang of coolies, under the pretext that the money for the right of way in his territory has not been advanced, and when this was made good, he held that the graves had been unduly interferred with. With this exception the whole road is now in fairly good condition, enabling through traffic of a kind to be caried on. A few short sections have to be repaired, and the sand hills removed in other parts and the "road" will be completed. The prevailing winds in this section of China will always carry the sand and make drifts along the road, according to those who have made the trip. One or two trucks have successfully negotiated the trip between Peking and Tientsin, while many motorists have used the road, making an average time of about five hours between the two cities.

Kalgan to Peking.—The road from Peking to Kalgan has generally been considered impassable except to carts but Mr. Charles Coltman, of the Mongolia Trading Company, and Mr. Williams recently brought two Dodge Brothers cars from Kalgan to the capital over the road on what they termed a "wonderfully rough" trip.

The distance by rail is 116 miles but the road is several miles longer, probably nearer 125 miles. Mr. Coltman considers it marvellous that they arrived with whole cars. They negotiated seemingly impossible stretches of alleged highway, seamed with deep cart wheel ruts and ditches.

Shansi Roads

The governor of Shansi, General Yen Hui-shan, has shown considerable interest in road building and under his initiative a road has been completed connecting Taiyuanfu, the provincial capital, with Taikuhsien an important educational centre distant over 30 miles to the south. Under the new provincial system this road will be continued further south to Pingyangfu, distant from Taiyuan 140 miles. This will pass through Sukow, Kihsien, Pingyaohsien (connecting at this point with the Fenchow-Yellow. River road), Kiehsui, Lingshih, Hwochow, Chaocheng and Hungting. At Pingyang it will undoubtedly be extended along the time honored route through Kiangchow, Wensi, Anyihsien and Chiehchow to Pukow in the extreme southwest corner of the province where it will connect with the Shensi road system. On the north, a road is to be built from Taiyuanfu to Kuohsien, distant 70 miles, passing through Chengtsin and Sinchow. This road will ultimately lead on to the north to Tatungfu and eastwards over the old road to Peking and Wutaishan.

The Pingyao-Jungtu Road.—The most commercially important of the roads built under the red cross supervision is the one in Shansi province which leaves the provincial highway at Pingyao-hsien and passing through the large city of Fenchow terminates at Jung-tu the Yellow River, providing a water outlet to an immensely wealthy district. Writing in the *China Press,* Mr. Wes Williams describes this road as follows :

"The Ping Yao-Fenchow road in its passage westward over the plain crosses the entire drainage area of the province. The road has no grades as there is a difference in the elevation of not more than 17 feet in twenty miles. This road at the top is 22 feet wide and has an average height of a least three feet and a half.

"The dirt work was paid for at the rate of ten cents gold per hundred cubic feet. Later the road was surfaced with ashes. There are only a few small curves and the road could be used at any time for a railroad bed. The only problem in this stretch of road is the bridge across the Fen River. It is expected that the bridge in use at the present time will be washed out in the spring rains. With this in mind, not much money was expended on it.

"The Yellow River road out of Fenchow west crosses the divide between the two rivers Yen and Yellow. Fenchow itself has an elevation of 2,200 feet. To the top of the pass, a distance of 24.9 miles there is an average rise of less than three feet per hundred to an elevation of 5,200 feet above sea level. The decent on the Yellow River side of the pass does not go down so far because this river is higher than the Fenchow plain.

"The road winds around mountains and twists upon itself like a huge serpent. There are fills 90 feet deep, cuts 60 feet deep running for long distances through loess formation and stretches through solid volcanic rock which cost $1.75 gold per cubic foot to blast out a road. In all there are 22 bridges, and 454 culverts.

The last bridge near the terminus on the Yellow River at Chung Tu is 85 feet above the stream bed and will be a two deck, spondrell arch structure.

"The direct road from Fenchow to Taiyuanfu runs along the edge of the mountains just a little above the level of the plain and gives many fine views. It has required only a small amount of stone-blasting but there is one stone bridge which has twelve arches each being twenty feet in width.

"For these three roads and the narrow road from Fenchow to Yu Tao Ho, the American red cross appropriated silver $721,000 and the Shansi famine relief society (also largely American funds), $250,000 for a total of 173 miles of road.

"None of the three main roads is fully completed. Contracts have been let and the work is under way to finish the big bridge at the terminus and a stretch of stone blasting on the Yellow River road. The contracts call for an additional outlay of approximately $75,000 of which a further grant has been made of $25,000 by the Shansi famine relief society but where the remaining $40,000 is to come from none of the field directors were in a position to say.

"Half of the 173 miles of road passes through difficult mountain territory and 30,000 laborers were required since operations started in March. At one time they had as many as 50,000 laborers. In all they employed 75,000 different men. Captain McDonnell, U.S.A., was the first engineer to make an investigation of the possible route and in April Major Joseph W. Stilwell took charge as head engineer. His task was an extremely difficult one.

"There were all sorts of questions pressing for decision, complicated problems of construction, supervision of overseers and laborers largely new to such work, the base of supplies a long distance away and none too large a staff of assistants to help him. The enterprise owes much to his tireless energy and practical judgment. Another U.S. army officer who served as engineer for six weeks was Major Horsfall.

"On August 1st, when Major Stilwell left, Mr. Carl Hildebrand, an engineer loaned to the American red cross by the Standard Oil Company, took charge."

The Pingting-Liaochow Road.—Second in importance to the Pingyao-Jungtu road in western Shansi is the one in the eastern part of the province built by the red cross engineers which runs south from Pingting to Liaochow through the heart of the richest coal, iron and pottery district in China. This road brought new life to a section stagnating for lack of communications. Prosperity came to the potters who turned out vitrified clay pipes and drains at extremely low costs while the iron workers found steady work in furnishing shovels, picks, hammers, rollers and other tools required in road construction. A very interesting report on this road by John Andrew Goette was recently circulated by the *Chun Mei News Agency*. He says: "The old road was merely a donkey path that scrambled over river beds and over peaks and which in wet weather was very dangerous. The people had never seen a cart much less having used one. Hence when the famine struck this area, the necessity and desirability of a road running south from Yang Chuan to Liaochow was apparent to all. The engineering difficulties were great. Yang Chuan is on an elevation of 2,184-ft. and in going south a road would have to cross mountain peaks 2,511-ft., 3,128-ft., 4,834-ft. and 5,035-ft. and then drop down to Liaochow at 3,688-ft. in addition to which it would be necessary to cross 12 rivers ranging from 200 to 1,900-ft. in width.

"Work was started late in February with famine relief labor and by August 10th most of it was finished, there remaining some culvert and bridge construction to be finished. The cost per mile is $7,000 Mex. which includes bridges, culverts, surfacing, food for the laborers, medical and engineering supervision, etc.

Looking North up the Yellow River at Jung Tu, the end of the Red Cross Road

SHANSI ROADS

Entering Mut-Sun

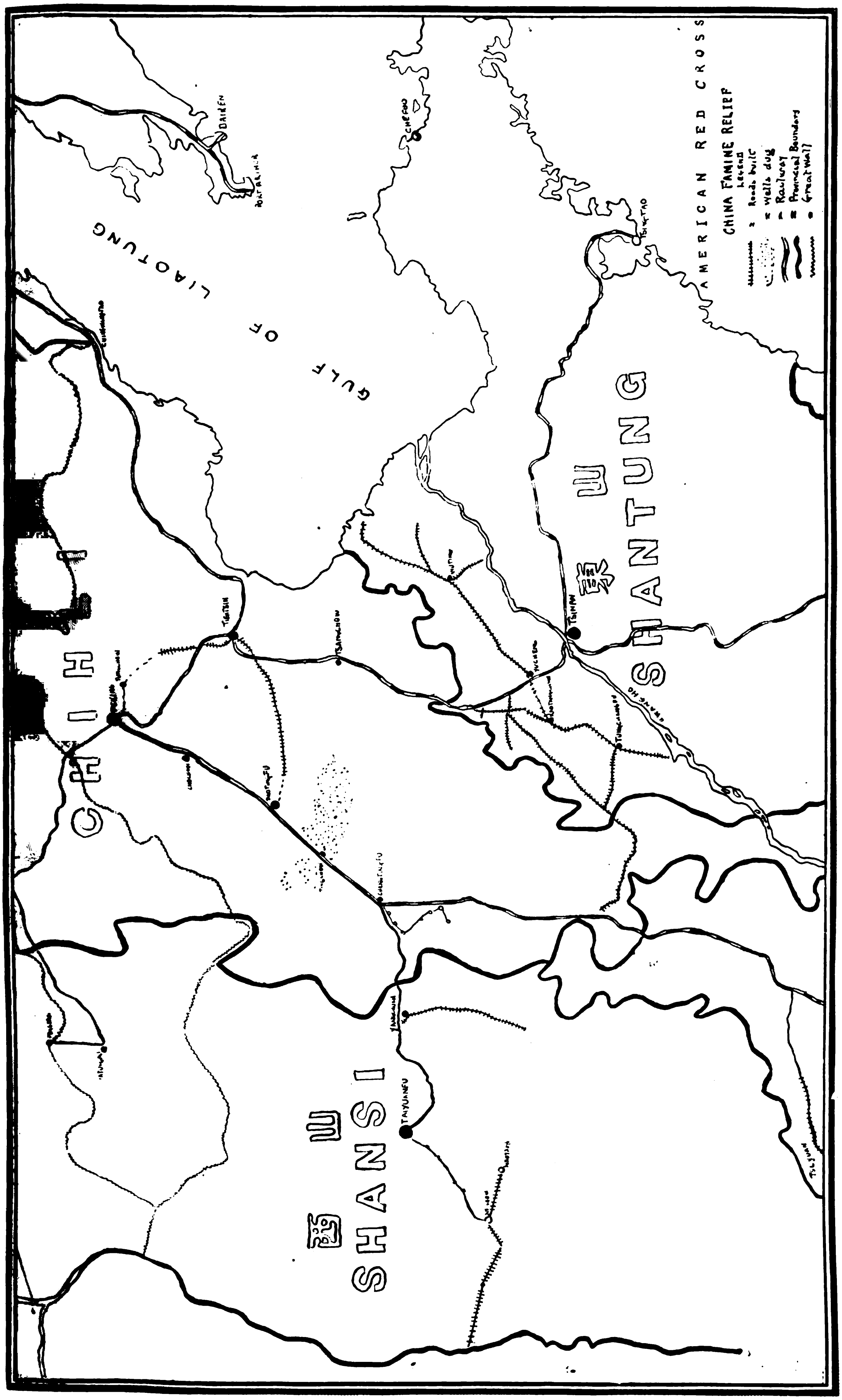
"There were constructed 237 bridges and culverts ranging 135-ft.-in length. Over a thousand feet of stone retaining wall was built; 54 dips., 20-ft. wide and from that same length to twelve hundred feet long were paved.

"The road has a mean width of twenty feet and in some of the sharper curves on the high peaks it broadens out until it is nearer thirty.

"Surfacing is well along, there being three materials employed. On the level stretches the loess is packed down very hard. Where the road runs close to the blast furnaces, iron slag is used to good advantage. This makes a pretty looking black road which is practically dustless and not subject to bad cutting up. The third method is loose stones gotten from the blasting operations, which are well tamped. In one place it was necessary to blast about a mile of solid rock to put in the road. In others the loess was cut away to a depth of thirty or forty feet.

"The greatest grade is only 7.7 per cent. and this lasts but for 0.28 per cent. of the length. Over 84 per cent. of the road has a better grade than 5 per cent. The four automobiles making the inspection trip had no difficulty whatsoever in making the pulls or the turns.

"That the surface of the road is good, is borne out by the fact that a motor car made the eighteen-mile run from Le Ping to Pingtingchow in forty minutes and the six-mile trip from Pingtingchow



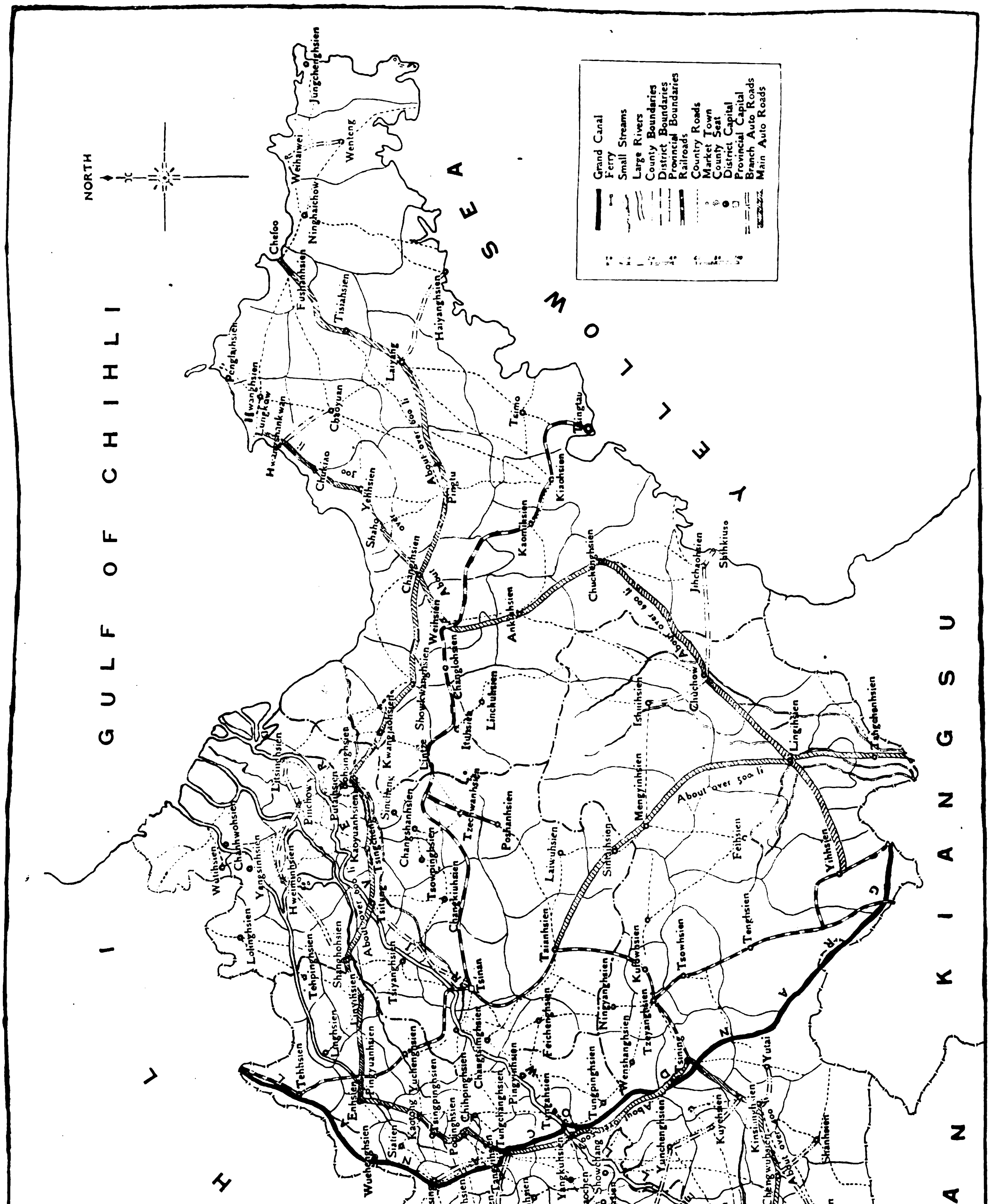
Red Cross Roads Constructed in North China

to Yang Chuan in fifteen minutes with a very bothersome mule and donkey pack traffic on the road.

"Transportation companies will undoubtedly be formed. However, the governor has forbidden the use of any but wide tired carts on the new road and the American red cross has been teaching the local wheelwrights how to make the best type."

Shantung Roads

Excepting the roads in the vicinity of Tsingtao commenced by the Germans and finished by the Japanese, the construction of good highways in this province is confined almost exclusively to those recently completed by the red cross engineers, and the Chefoo-Weihsien highway by the ministry of communications. It may be said that Tsingtao and the leased territory of Kiaochow is better supplied with modern roads than any other part of China. Only in Hongkong and Kowloon can one get such enjoyment in motor riding as in Tsingtao. These fine motor roads wind in and around the wooded hills, along the shore and batteries, by old German forts and out thirty miles into the country to Mount Laoshan or to the waterworks, a constant reminder of what other parts of China would be under efficient government. The total length of the streets and roads in the leased territory were doubled since the Japanese took over control in 1914. Within the municipal limits of Tsingtao the Germans laid 65,300 metres of macadam



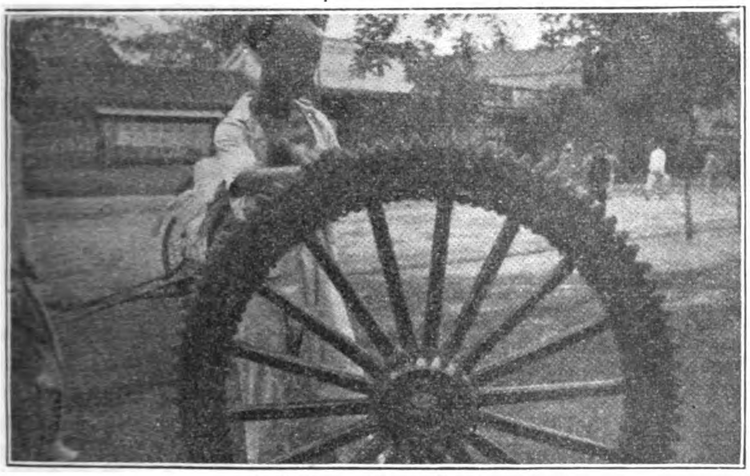
Map reproduced by courtesy of "The China Press," Shanghai.

Map Showing Contemplated Road Improvements in Shantung as Approved Last Year by the Provincial Government. Some of these roads were Subsequently Constructed by the Red Cross Engineers

and 3,400 metres of asphalt roads. To this the Japanese have added 27,290 metres of macadam and 13,300 metres of asphalt streets, while outside in the city in the leased territory the Japanese added 17,390 metres to the 27,290 metres of macadam roads completed by the Germans. In July last the Japanese authorities entered into a further contract for the extension of municipal macadamized streets in Tsingtao in the new industrial section, totaling approximately four miles.

The excellent work of the American red cross in building roads in this province has been described so often during the past year that repitition seems unnecessary. Sufficient to say that 485 miles of mud roads were built at a cost of $834,000 Mex., an average of $1,719 per mile. These roads are merely graded dirt, rolled or tamped firm. Macadamizing was out of the question because of the excessive cost of furnishing crushed stone. The scarcity of stone in these vast stretches of alluvial plain compelled the German engineers when building the northern section of the Tientsin-Pukow railway (which passes through the same districts as the main red cross roads) to erect great kilns to make brick from the excellent clay, which was afterwards broken to furnish ballast for the road bed. Mr. J. E. Baker, in charge of the red cross road-making operations, commenting on this, says:

"The standard width of these highways is 20-ft. If a centre crown 14-ft. wide were made of macadam 8-in. thick before rolling (which would mean about 6-in. thick after rolling), each lineal foot of highway would contain 9-13 cubic feet and a mile would require 49,280 cubic feet. At 100 pounds per cubic foot, each mile of macadam would amount to roughly 2,500 tons, or five train-loads or at the rate of seven trains per day for a year. In other words, the entire freight service of the Tientsin-Pukow line over the section in Shantung would be required for one year in order to macadamize the red cross roads.



A Chinese Road Devil

The saw tooth wheel of a swagger Peking Cart, the "bete noir" of the modern road maker

"Calculate the problem in a slightly different way. The rail haul upon this rock from the nearest source of supply to the railway stations from which it could be distributed would average 150 kilometres, and at the extremely low rate of four miles per ton kilometre, the freight would amount to 60 cents per ton, or $1,500 per mile. The mere railroad freight upon this rock would amount to $750,000 or not far short of the entire amount spent by the red cross on highway construction. But remember that this rock would then only be at the railroad and it would have to be carted an average distance of 300 *li* on either side of the railway. Assuming an average rate of 6 cents per ton per *li* for carting the rock from the railroad to the point where it is needed, and we arrive at the tremendous figure of $45,000 per mile for carting the rock to the point where it is to be put into place. There is no need of considering the cost of the rock or of putting it in place. Already the figure is over $22,500,000 for transporting the macadam for these 500 miles of highway. Perhaps as the macadamizing progressed, unit costs could be reduced, but only one-fourth of the area of Shantung would then be served by a mere skeleton of trunk lines. Ultimately, this is by no means an impossible task, but under the present financial condition, not only of the Chinese government, but of the Chinese people, such an expense is not to be contemplated. The situation in Shantung is typical of the situation in Chihli and of the whole coastal plain of China measuring several hundred miles broad and several more hundreds of miles long. If in this generation there are to be roads in China which will actually connect up provinces and serve the whole territory from Peking to Canton, some other factors must be brought into the question."

It is of supreme importance that manufacturers of road-making machinery keep Mr. Baker's statement always before them in estimating the possibility of finding a market for their products in eastern China. The character of the country compels the adoption of the rolled mud road, except in such short stretches in proximity to river beds where gravel may be obtained, or hills from which suitable stone may be quarried.

Over the Wuting-Yucheng section of the new red cross road in Shantung a company with $500,000 capital is being organized by Mr. Liu Ying-chang to operate a motor bus service: the distance is about fifty miles, while from Yuchen to Tungchangfu (fifty miles) another company capitalized for the same amount is being promoted by Mr. Pao Lien-shui. Both of these schemes have received the approval of the ministry of agriculture and commerce. Still another application has been made by Mr. Moh Fan-dong for permission to operate a motor bus service over the new road between Tsinanfu and Laokow. He has organized his company with $20,000 capital.

In addition to the Chefoo-Weihsien road constructed by the ministry of communications, a special bureau has been established at Chefoo for the construction of roads from the port to Weihaiwei, Laoyang and Haiyang respectively, a total of about 130 miles. This scheme has been formulated by the commissioner of customs at Chefoo and it is said that an appropriation of $240,000 will be made from the salt gabelle surplus for their construction. These three roads will complete the opening up of the rich hinterland behind Chefoo and bring greater prosperity to that port.

In the southern part of the province of Shantung a motor service was established on June 10 between Tsaochwang and Ichow a distance of about 50 miles. In the Kiaochow district the Koo-Tung Automobile Company has been organized in Tsingtao to build a road and operate an auto bus service between Lantsun and Tingtu.

Manchuria

Reference to the service bulletins of THE FAR EASTERN REVIEW for the past six months will give the reader a comprehensive idea about new roads and automobile companies in China. From Heilungkiang on the north to Canton and Yunnan on the south, from Shanghai on the east to Chengtu on the west, we hear of new roads, and streets being built and automobile and autobus companies organized. In the larger centres autobus companies have been active for a long time and each week brings news of new extensions. In the winter, the frozen plains and roads of Northern Manchuria permit of rapid traveling between Harbin and Tsitsihar and the towns on the Amur. In Harbin, the Russo-Asiatic Bank operates a motor-truck service for the handling of freight on the C.E. Railway and the streets of Dalny provide evidence in the shape of immense trucks employed by the S.M. Railway for the transport of bean cake and other commodities between the mills and the docks and warehouses. The road between Dairen and Port Arthur is being pushed through. Automobile companies are being organized for Antung and the Yalu valley.

The Antung District.—In Antung a Dutch engineer has been engaged to carry out the surveys for new city roads extending into the nearby country and an automobile company with $25,000

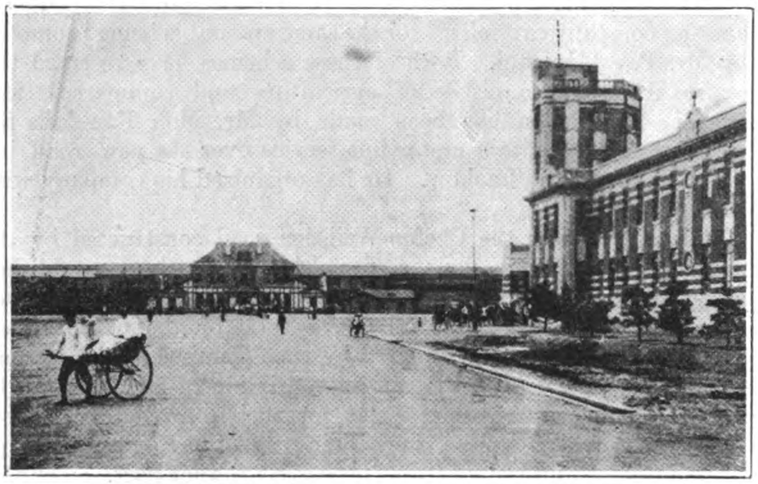
capital is being organized by Mr. Yang Ying-chong. Another enterprise called the Antung-Taikooshan Automobile Transportation Company has applied for permission to operate a service.

Native Roads Described

A general report on the roads of the Antung district was made last year by American Vice-Consul C. J. Spiker, which is typical of the other parts of North China. He says:

With the exception of the streets of Antung and of a few other cities, there are no highways worthy of the name in the Antung district, and no official or private projects for road construction, repair or maintenance, outside of the Japanese settlement in Antung. The roads in the rural sections are nothing but rocky trails or stream beds, passable only by the primitive, but exceedingly strong, native carts and pack animals. Passage of most of these roads by a four-wheeled vehicle would be an impossibility. Bridges are practically non-existent, the smaller streams being crossed by Fords, and the larger ones by means of crude ferries.

The roads are at their best during the winter months when the ground is frozen. After the spring thaw and during the rainy summer months the roads along the plains frequently become impassable quagmires or canals, in which four and five horse teams are frequently bogged and only extricated with great difficulty. In the winter months much of the cart and pack-train traffic is diverted to the broad stretches of the frozen Yalu and other rivers and streams of the district. The rivers can generally be used for cart traffic from the middle of December to the middle of February.



Streets in the Japanese Concession at Antung

Provisions for Maintenance of Roads

In very rare instances when, through flood or other cause, traffic becomes absolutely impossible over a stretch of country, the local officials levy a tax on the inhabitants of the locality in order to restore communication, but such action is resorted to only in extreme cases. As a general practice the roads in this district are maintained by the merchant guilds of the various localities, these guilds collecting subscriptions, disbursing the funds, and supervising the work, without any action whatever on the part of the local officials. The maintenance of the few bridges existent is usually provided for by the guilds that supervise the roads. These crude bridges are generally of very unstable construction, requiring the constant attention of caretakers, who generally exact a toll from those using the bridges. There is no government direction of construction and maintenance.

There is ordinarily no tax levied on abutting lands, the only tax money utilized for road construction being that levied by local officials in the rare emergencies referred to above. In the supervision of the roads under their "jurisdiction" the merchants' guilds assess guild members a small amount for road repairs, and also solicit subscriptions from the farmers and other members of the local community. There is no uniform method observed in the levying of such assessments and subscriptions, although in a general way it may be stated that the amount of subscription is based on the property holdings of the individual. Farmers frequently donate their labor in lieu of a cash subscription.

Cost of Hauling Freight

There is no fixed scale of charges for freighting between any two points, the price being a matter to be settled by bargaining on each occasion and depending upon the available supply of carts, the condition of the roads, the weather, political condition of the country to be traversed, character of freight to be carried, etc. Light, bulky freight, such as silk cocoons, pays an appreciably higher rate than heavy, compact freight, such as beans, kerosene, piece goods, and flour, the determining basis of charges apparently being the bulk earning capacity of the cart for "heavy" as opposed to "light" freight.

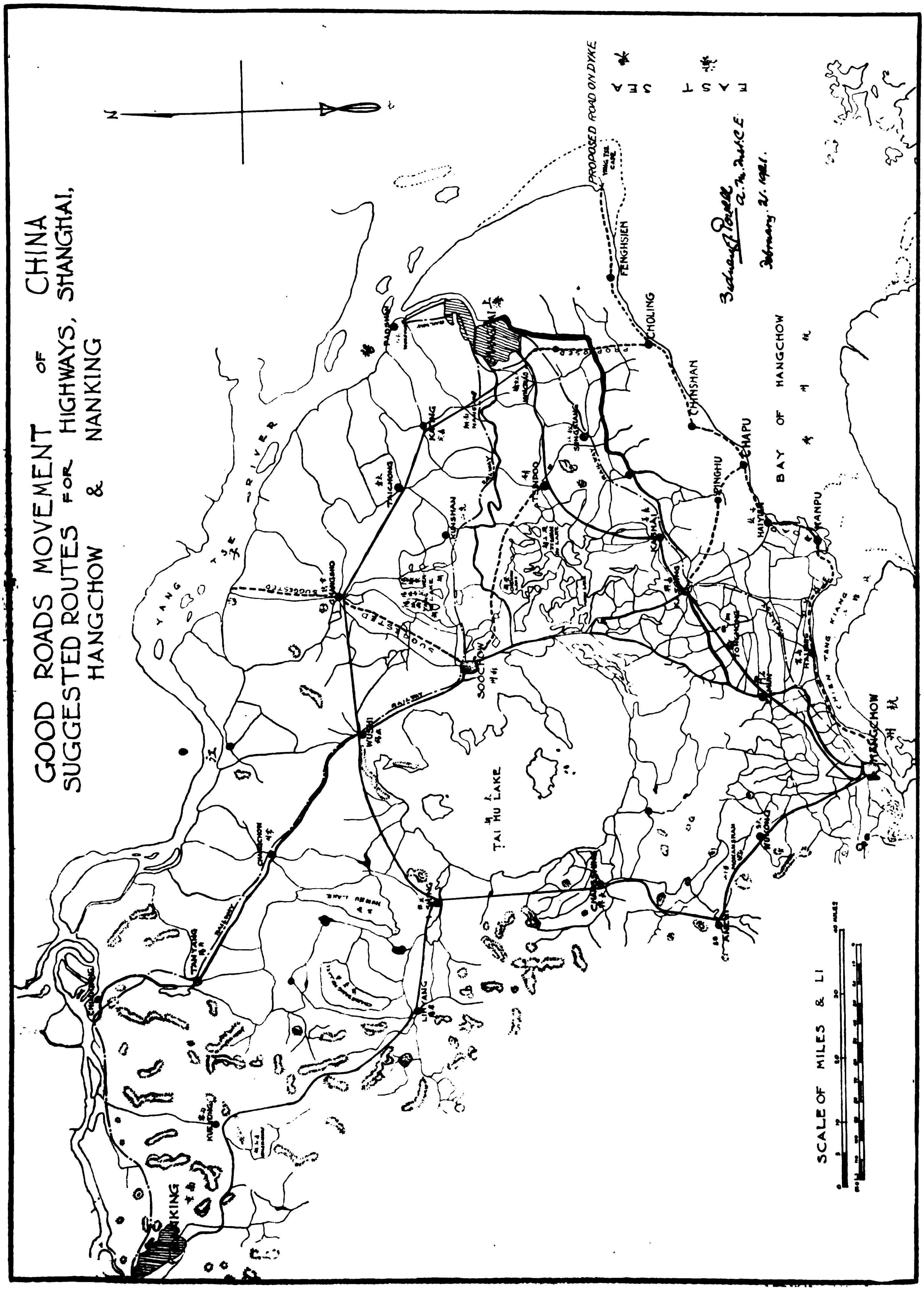
The average charge per day for the service of a 2-horse cart in hauling freight in the Antung district is $4.68 United States currency ; the maximum load is 1,066 pounds, and the average day's journey is 40 miles. The charge for a 3-horse cart is $5,61, the maximum load is 1,600 pounds, and the average journey is 30 miles.

A Street in Antung

The services of a 4-horse cart for one day cost $7.01, and the maximum load is 2,133 pounds, over an average distance of 30 miles. For a 5-horse cart the rate is about $9.35, the maximum load 2,666 pounds, and the average day's journey 30 miles. The cost per ton-mile in each instance is from $0.24½ to $0.26. These charges are based on rates quoted by firms engaged in overland freighting. The average haul is computed on a daily basis. But when the roads to be traversed are above average and the route lies through a region free from robber bands a flat rate for the trip is sometimes made. It is to be particularly noted that the above prices are calculated at the present rate of exchange, i.e., $1 gold equals local small coin $1.068, or at the rate of $1 gold for $0.93 Mexican.

Cost of Carts, Draft Animals, Etc.

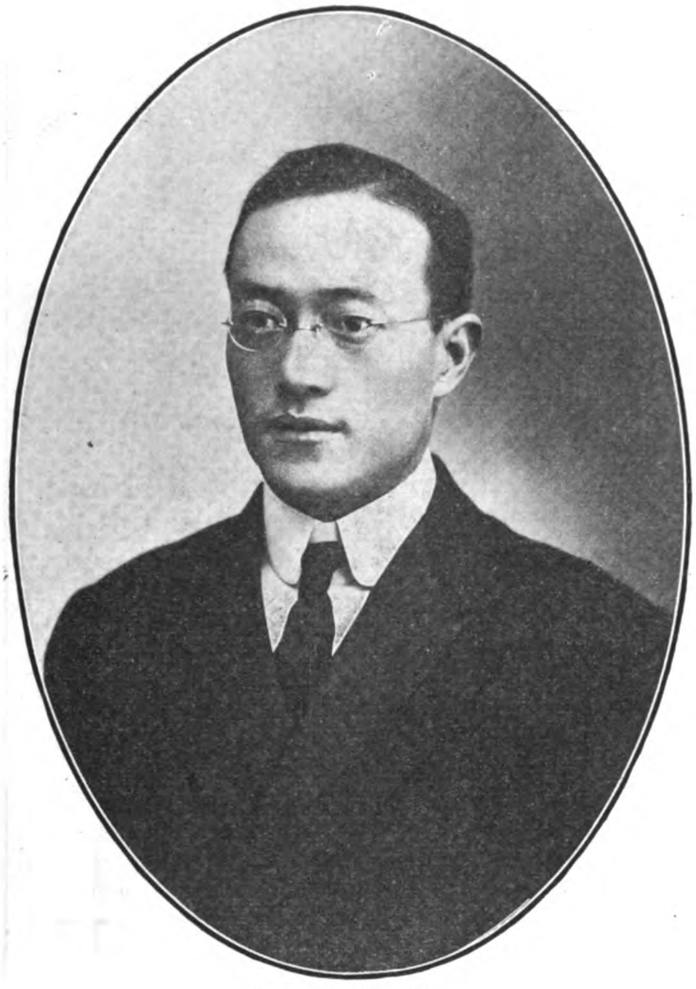
There are no motor vehicles whatever used in freight transportation in this district and there are only three passenger automobiles in Antung. All overland hauling is done by means of the native carts, or by pack train. The carts, which are without springs or covering, are very strongly made, and seem admirably adapted to withstand the exceedingly rough usage to which vehicles are subjected. A large cart costs the equivalent of $140 gold. Teams consisting of two to seven draft animals are used to draw freight carts, the number of animals varying with the load carried. The team in most common use consists of four or five animals, horses, mules, donkeys and bullocks being used for this purpose. A team in which a mule, a donkey, a bullock and two horses are hitched to the same cart is a common sight in this region. Although there


GOOD ROADS MOVEMENT OF CHINA
SUGGESTED ROUTES FOR HIGHWAYS, SHANGHAI, HANGCHOW & NANKING
EAST SEA
PROPOSED ROAD ON DYKE
FENGHSIEN
CHOLING
CHINSHAN
CHAPU
BAY OF HANGCHOW
KANPU
HAIYEN
KASHING
PINGHU
SOOCHOW
WUSIH
TAI HU LAKE
HANGCHOW
KUNSHAN
TAICHONG
YANG TSE RIVER
SCALE OF MILES & LI

is a wide range in prices, the following are average gold prices for draft animals at present exchange rates: Horse, $90; mule, $75; bullock, $38 and donkey, $14. The average daily wage of a cart driver is 50 cents "small coin" ($0.47 gold) plus the cost of food and lodging.

Number of Carts Available for Transport

The total number of carts of all varieties in use in Antung city approximate 1,000, but of this number only 50 are used for rural long-distance freight hauling. Within Antung city, most of the local freight hauling is done by means of small hand-drawn carts and wheelbarrows. One vehicle in very common use is the "*p'ing ch'e*," a small two-wheel cart with a carrying capacity of about 800 pounds. These carts, of which it is estimated there are 700 in Antung, are usually drawn by a man and donkey, hitched tandem, the man being placed in the shafts. While there are no figures upon which even a very rough estimate of the number of freight-carrying carts in this district can be based, local Chinese have stated that there are perhaps 2,000 large horse-drawn carts in the 18,000 square miles of this district, with three times that number of other freight and passenger vehicles.



Dr. C. T. WANG,
Chairman of the Good Roads Movement

Shanghai Region

Great activity is seen in the Shanghai region under the stimulus of the goods roads movement and its energetic president, Dr. C. T. Wang, who has retired from political life to devote himself to business and development work. The map of Kiangsu herewith presented, will give some idea of the comprehensive system of provincial and local roads projected or in course of construction. In addition, there are many secondary roads such as one from Pootung to Nanhui near the Yangtze cape, which will continue westward and connect with the dyke road shown on Mr. Powell's map. When this system of new roads is completed, Shanghai will have direct auto connection with Nanking on the north, and through Kashing and Huchow to the Anhwei border or the west where the road will merge into the Anhwei provincial system and carry on to Wuhu. The road through Hangchow into Chekiang is to be extended south into Fukien and westwards into Kiangsi.

The Good Roads Movement.—This was largely the conception of Dr. C. T. Wang and was organized first as a committee of the Pan-Pacific Association with Dr. C. T. Wang as chairman and Mr. George E. Sokolsky of the government bureau of economic information as secretary. The following were elected to serve on the executive committee: Mr. W. W. Lockwood, Dr. F. C. Tong, Mr. Yung Chung-ching, Dr. P. W. Kuo, Mr. Chao Ching-hua, Mr. Bernard Firth, Dr. T. K. M. Siao, Mr. Sidney Powell, Mr. C. C. Nieh, Judge J. Ross, Miss Gretchen Fitkin, Mr. Allen Loehr and Lieut.-Col. M. H. Logan.

At the outset it was found that the greatest impediment to the building of good roads was the ignorance of the people and the unwillingness of the officials to spend money. The committee therefore decided upon a course of educational work among the masses. This sort of activity is not spectacular and results cannot be seen immediately. But it can be said that it was largely as a result of the discussion with regard to good roads which this organization started in the Chinese press that a number of private companies were formed in the vicinity of Shanghai to build roads and run motor bus lines to cities along Hangchow Bay and the Whangpoo River which are ordinarily not reached by the railroad. Plans are under way to build such roads to Chapoo, Minhong and other cities.

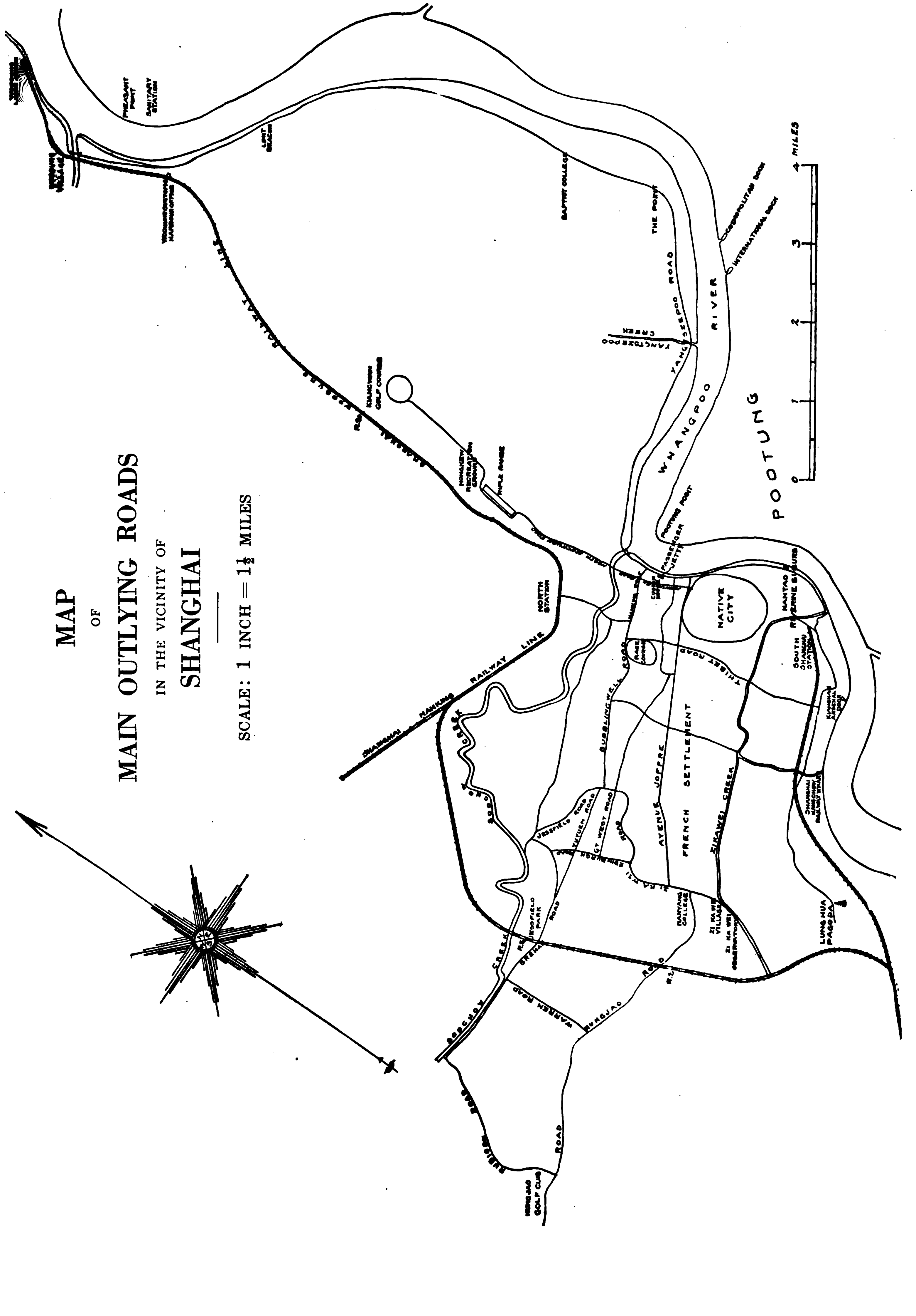
The goods roads movement has also been able to obtain a promise from General Lu Yung-hsiang that he would permit the employment of troops under his control for the building of roads in Chekiang province and in those districts of Kiangsu province which are under the control of his military officers. The road building bureau of Chekiang province had worked out a scheme for the building of roads from Hangchow in every direction to the borders of the province. One of these roads will become the basis of the road from Shanghai to Hangchow.

Under the direction of Mr. Sidney J. Powell, a plan has been worked out for the building of a road from Shanghai to Hangchow and another from Shanghai to Nanking. The good roads movement of China does not propose to build these roads. Its aim is to stimulate an interest in them; to educate the Chinese along the route to favor the road and to get the officials concerned to approve of it. The governors of both Chekiang and Kiangsu provinces have written to the movement in support of the roads planned and offering to give their assistance. There can be little doubt that the road from Shanghai to Hangchow is a matter of the near future.

The work of the movement was in the hands of a sino-foreign committee, which for various reasons did not produce visible results. One reason was that until recently no charter was obtainable from the government. Another was the newness of the work and the fact that the organization was feeling its way. Now, however, Chinese have shown a greater interest in the good roads movement and are contributing large sums of money to its support. It is hoped that the foreign end of the work will shortly be re-organized, in co-operation with automobile dealers and that results will soon be produced.

At present the good roads movement is organizing solely in Shanghai. But the movement is national in scope and plans to organize branches in every province.

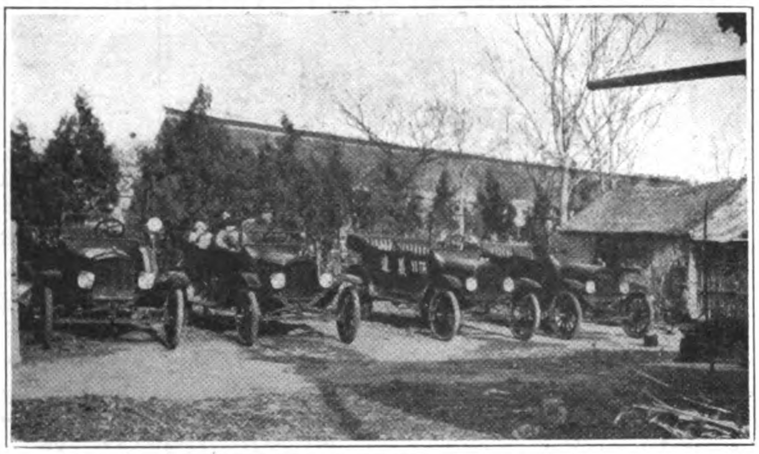
Kiangsu Roads.—The projected Kiangsu road system radiating from Shanghai seems assured of success. Several companies have been formed or are in process of promotion with sufficient capital to undertake their construction and purchase the required equipment. The Chekiang and Kiangsu provincial military and


MAP
OF
MAIN OUTLYING ROADS
IN THE VICINITY OF
SHANGHAI
SCALE: 1 INCH = 1½ MILES
WHANGPOO RIVER
POOTUNG
NATIVE CITY
FRENCH SETTLEMENT
AVENUE JOFFRE
BUBBLING WELL ROAD
SHANGHAI NANKING RAILWAY LINE
NORTH STATION
YANGTZEPOO ROAD
YANGTZEPOO CREEK
ZIKAWEI CREEK
SOOCHOW CREEK
HUNGJAO ROAD
WARREN ROAD
JESSFIELD ROAD
GREAT WEST ROAD
SOUTH STATION
THE POINT
POOTUNG POINT
LUNG HUA PAGODA
NANYANG COLLEGE
BAPTIST COLLEGE
INTERNATIONAL DOCK
COSMOPOLITAN DOCK
SOUTH SHANGHAI STATION
NANTAO RIVERINE SUBURB
MILES
0 1 2 3 4

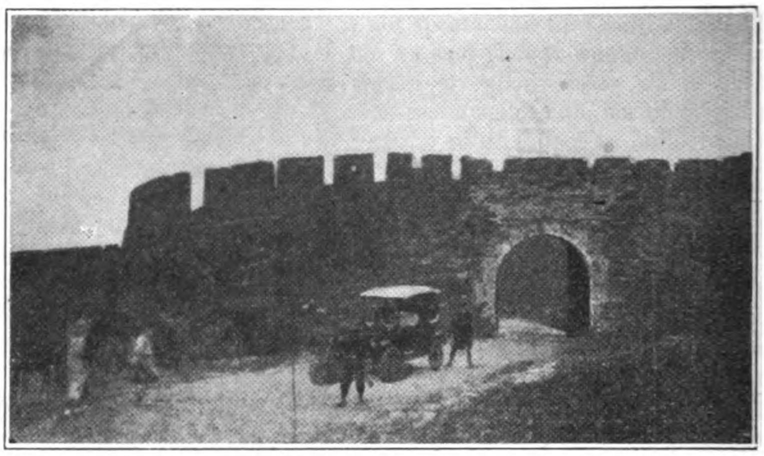
civil authorities are also taking a keen interest in the program advocated by Dr. C. T. Wang and have promised assistance in surveys if not in money. For the practical execution of the Kiangsu road program, the Shanghai-Taichong Automobile Transportation Company has been organized to operate between Shanghai and Taichong, an approximate distance of 25 miles. This company started operating a service over the first ten miles of completed road between Shanghai and Lutien on January 1st, with five new American busses and several autos. In connection with the Shanghai-Taichong road there has been organized another enterprise called the Changsho-Taichong-Shanghai Automobile Transportation Company with a capital of $500,000 which will take up the work from Taichong and carry it on 25 miles further to Changsho. It will operate its autobus service in connection with the Shanghai-Taichong Company in order to give through service. Another large company known as the Soochow-Kashing-Huchow Automobile Transportation Company is in process of promotion and will take up the work at Taichong and carry it on through Quinsan to the provincial capital at Soochow, an approximate distance of 30 miles. This section will be the first to be built so as to connect with the first mentioned company and provide through traffic between Soochow and Shanghai. The second section of this ambitious enterprise will connect Soochow with Kashing and thence proceed westward to Huchow, another 85 miles, and thence on another 35 miles to Kwanteh in order to connect with the Anhwei provincial road system. Another section will strike north from Soochow passing through Changzao to the Yangtze River, while still another route shown on Mr. Powell's map will strike southeast from Kashing and pass through Pinghu, terminating at Chapu on Hangchow Bay and the proposed dyke road. This is the most ambitious program in this section of China and if carried out will place Shanghai in connection with other provincial systems and permit of through traffic into districts that will not be opened up by the railway for another 20 years, if ever. The company has been organized under the direction of Mr. Chen Hui-yu with a capital of $3,000,000 the shares to be issued through the Sino-Foreign Trust Company. The entire scheme embraces about 250 miles of new roads. This Company evidently intends to absorb some of the minor concerns such as the Sean-Kwanteh Motor Road Company organized in April last to build a road and operate a motor service between Sean in Chekiang and Kwanteh in Anhwei at a cost of $300,000. This is the western section of the Huchow-Kwanteh highway embraced in the larger scheme.

The importance of the central Kiangsu scheme will be better appreciated when considered in relation with others in contiguous territory. For instance, on the north, once the new roads reach the Yangtze at Chinkiang, they will connect across the river at Kwachow with the North Kiangsu scheme. A company was organized in May last with $180,000 capital to build roads in that vicinity, the chief one to connect the river port with Yangchow. This is expected to be completed this year. The main road will then proceed north towards Tsingkiangpu and branch to Hsuchow and Haichow. The first section will connect with a local system of roads projected by the energetic Chang Chien and his associates connecting Yangchow with Nantungchow, at an estimated cost of $150,000, capital for which was subscribed last June.

Nantungchow.—This "model city," the creation of Mr. Chang Chien, located on the north bank of the Yangtze near its mouth may be said to be the "Dayton" of China, a city owing its inception, development and prosperity to the public spirit of its principal capitalist. The development of this town merits a book by itself, as here are found all up-do-date improvements, with libraries, schools, hospitals, museums, public park, prison, theatres, moving pictures, cotton mills, oil mills, match factory, flour mill, silk filature, iron works, electric light plant, banks and the other accessories to a modern business community, all on Chinese lines. It has its own steamer service with Shanghai, and to connect with the river port at Lu Ching King six miles away, there has been established a motor bus service, with cars supplied by the Central Garage of Shanghai. The first of these buses were built on Republic chassis of 1½-2-ton capacity. These have been supplemented by others built on Garford and Dennis chassis. In addition, another service is in operation connecting the city with Lan Shan, a popular resort, distant five miles.



A Flock of Fords operating in North Kiangsu



Ford Car near City Gate, Nanking

Nanking Roads

The Nanking authorities are also in line with a plan for the construction of four roads in this district: Tantu and Tanyang to Nanking; Chuyung, Kingtan to Nanking; Kusui, Liyang, Kuatsung to Nanking and Kiangpu, Luho to Nanking. New roads are also being built in Nanking and its immediate vicinity. The improvement of the highway from the Chao-Yang gate to Tang Shui, a popular resort where hot springs are located, about twenty or more miles from the city, is going on. The new road is to be twenty-five feet wide and that will make it possible for automobiles and carriages, as well as ricshaws, to go out to that interesting spot.

There are about 40 cars in Nanking, mostly owned by Chinese, with one hire garage operating six cars. The motor road around the walls of the city is about 30 miles long with another good road to the Ming Tombs and Purple Mountain. A company was organized in June last to build the road from Changchow to Hsiaowutseng in this section of Kiangsu, and still another in November to build a road from Changchoo to Wangling distant about 10 miles, at a cost of $30,000.

North Kiangsu Roads.—The merchants of North Kiangsu operating on their own initiative have organized the North Long Distance Automobile Service Company, which is now partly in operation carrying passengers between Hsuchow and points

eastward towards Susien on the Grand Canal. This company has purchased several machines from the Shanghai agent of the Ford company.

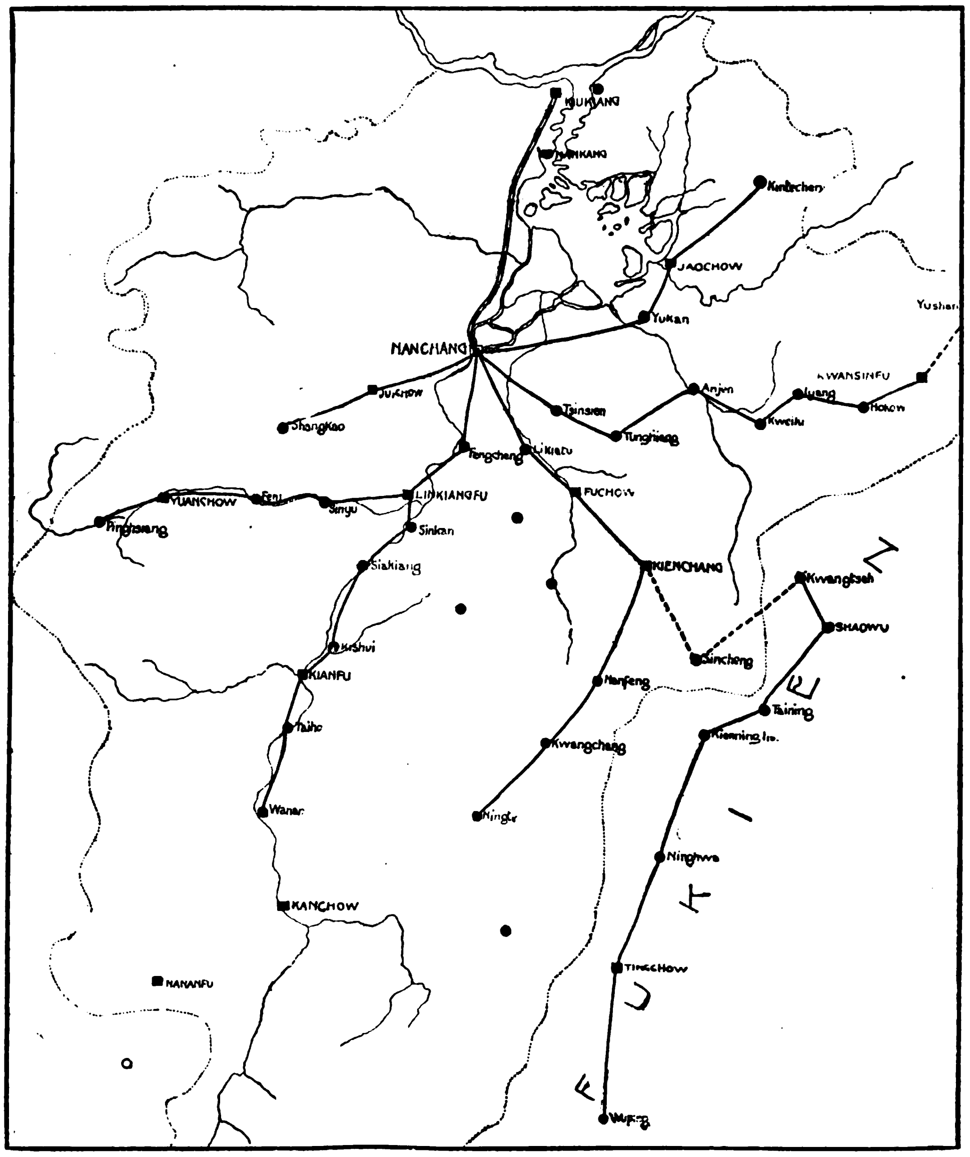
There is also the Lee Hua Company and the Yue Kong Transportation Company organized at Hsuchow each with $100,000 capital now operating in Northern Kiangsu and another company promoted recently to build a road in Northern Anhwei to connect Pengpu on the Tientsin-Pukow Railway with the town of Hweiyuan.

Chekiang Roads.—To the south of Shanghai, the Kiangsu system will connect with the roads building or projected by the Chekiang provincial roads bureau.

We have no complete data as to the entire road program of this province, but there are several important roads now under consideration, notably one running west from the provincial capital at Hangchow towards Yuhang, the first section of an inter-provincial road to Hweichow in Anhwei mentioned above. Another important road in Chekiang to be constructed by the provincial authorities will start in the Sin Chong Kwan Mountains and follow down the Yen Ki Valley through Chen Hsien to Shangyu, a distance of 170 miles, and is estimated to cost $1,000,000. An automobile company is to be organized to operate a service along this line. A short road is to be constructed from Ningpo south to Fenghua for operating a motor bus service. This road will be only twelve miles long, but will prove a highly profitable investment, while still another automobile road will connect Ningpo with Chinhai and Szechee.

The estimates of the Hangchow-Yuhang Motor Road and Transportation Company will give a general idea of the cost attached to these roads.

(1) Construction of the road from Kwan-ying-jao in Hangchow to Shan-tao-lung. Yuehong, measuring 50 Chinese *li*; costs $195,000 including land price, bridges and sluices, pebbles and lime, an average cost of $3,900 for one *li*; (2) $75,600 will be devoted to purchase of automobiles: 8 3-ton passenger auto-buses each capable of accommodating 24 persons, for Tls. 40,000 at Tls. 5,000 each, 4 cargo buses for Tls. 10,000 at Tls. 2,500 each and 2 common buses for Tls. 4,000 at Tls. 2,000 each; (3) six stations at $1,000 each $6,000, general office and car sheds, $4,000, making a total of $10,000; (4) $10,000 is to be spent in purchasing furniture, fixtures and office equipment and appliance; (5) $9,400 is to be set aside for meeting the office expenses.



Proposed Roads in Kiangsi Province

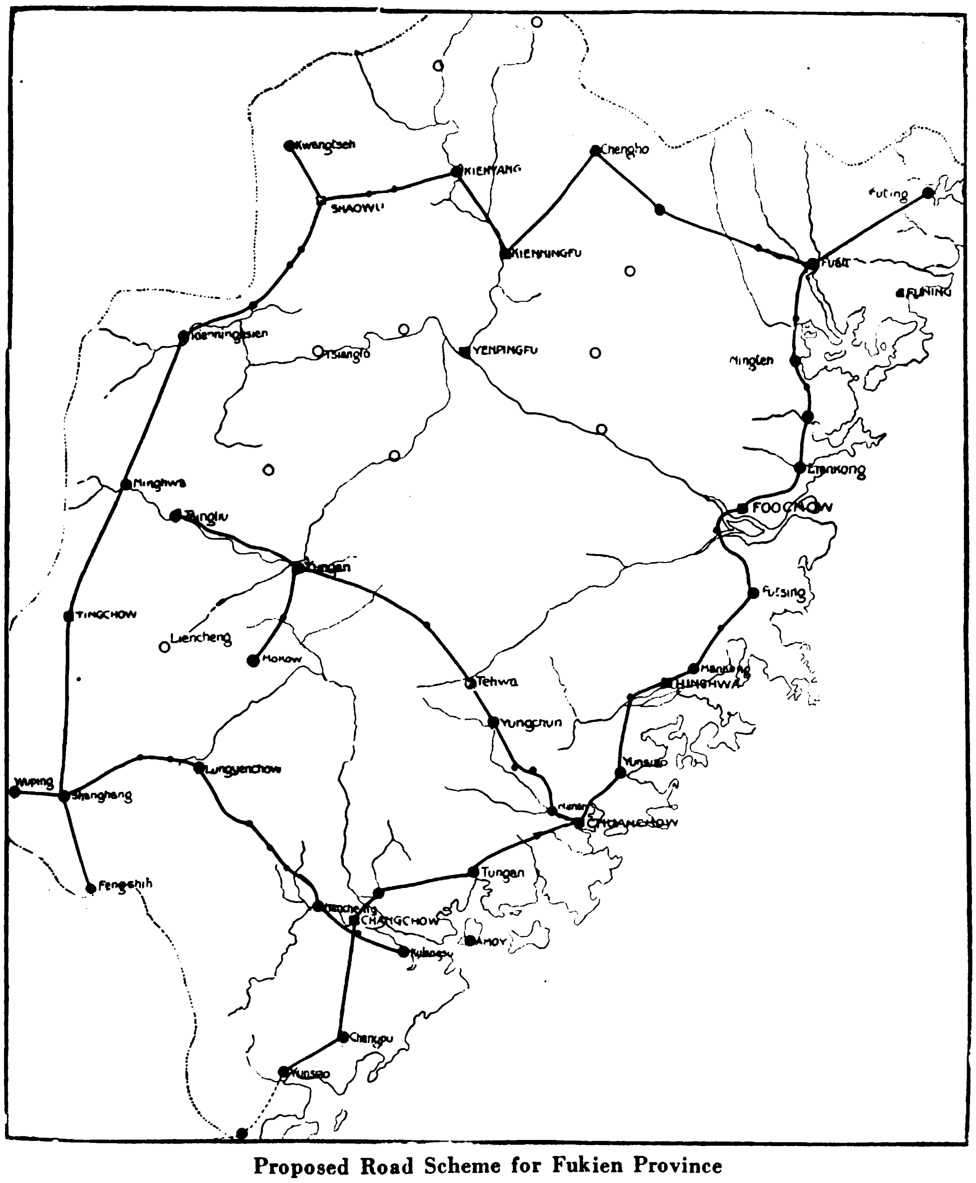
It is estimated that the yearly income will be about $144,000 with a yearly expenditure of $129,980 (this includes dividends), leaving a surplus of $14,020.

In this estimate, it will be seen that the cost includes land, bridges, etc.

Kiangsi Roads.—It will be some time perhaps before the Kiangsu highway system radiating from Shanghai, is carried through into Chekiang and Anhwei to the Kiangsi border, but once this connection is established, we link up with another comprehensive provincial system which carries us on towards Hunan and south to the Kwangtung border. The province of Kiangsi with its capital at Nanchang is the strategical key to the rest of South China commanding all the lines and routes to the east and south. The provincial road scheme embraces a total of 1,200 miles, estimated to cost an average of $3,000 per mile and five years to construct. The first and most important of these roads is naturally the one which passes through the richest agricultural and mining districts in the Kan River Valley. This road will link Nanchang with Kanchow passing through the important towns of Fencheng, Linkiang, Sinkan, Siakiang, Kianfu, Taiho and Wanan. The second line will branch off the Kan River road at Linkiang to connect with Pinghsiang. The third will run east from Nanchang to Kwangsinfu near the Chekiang border and here link up eventually with the Chekiang highways. The fourth will start at Nanchang and run up the Fu River Valley to Fuchow, thence to Kienchangfu and then to Ningtu in southeastern Kiangsi. At Kienchangfu, another branch will ultimately connect with the Fukien provincial road system and carry on down the Min River to Foochow on the coast. The fifth road will start at Nanchang and end at the great pottery centre at Kintechen, passing through Yukan and Jaochowfu, a highway that will ultimately form one of the principal sections on the main road west from Shanghai. The sixth highway will proceed from Nanchang up the Kin River valley through the important city of Juichowfu and terminate at Shangkao. Here we have a comprehensive system, which taken with the Anhwei, Chekiang and Kiangsu systems will bring through road transportation into the province of Hunan.

Fukien Roads.—Turning once more to the south of Chekiang, we find the Fukien provincial authorities also preparing elaborate plans for a comprehensive system of provincial highways which

embraces five main roads. The first of these, called the Fukien eastern or coast road is an important engineering project, necessitating many long and expensive bridges across the lower reaches of the rivers which abound in this province. Starting in the northeast corner of the province at Futing this road will pass through Fuan, Ningteh, Loyuan, Lienkong, thence to the provincial capital at Foochow and then southwards along the coast through Futsing, Hinghwafu, Hweian, Tungan, Changtai and Changchowfu terminating in the southeast corner at Yunsiao, a total distance of about 350 miles. The Fukien western road will commence at Fengshi and pass through Shanghang, Tingchow, Ningwa, Kienninghsien, Taining, Shaowufu and end at Kwangtseh on the Kiangsi border. Here it will ultimately connect with the Fu Valley road of the Kiangsi system. The length of this road is about 180 miles. The Fukien central road will start at Nanan on the coast road and pass through Tehhua, Yungan, Tsingliu and end at Hokow, a distance of about 140 miles. The Fukien southern road will start at Haiteng passing through Nantsing, Lungyen and Shang-hang, terminating at Wuping, a distance of 140 miles. The Fukien northern road will start at Fuan on the coast road and proceed west through Chengho, to Kienningfu, thence to Kienyangfu and terminate at Shaowufu, a distance of about 180 miles. Here we have a provincial system aggregating 1,000 miles of main highways estimated to cost about $10,800 (Mexican) per mile or a total of $10,800,000, a task well within the financial limits of the provincial capitalists. The Fukienese have already started to build macadam roads leading out from the important port of Chuanchow to Yungchun and between Huyang and Tehua for a motor bus and freight traffic, while a company was organized last June with a capital of $1,000,000 to construct the highway between Amoy and Foochow and operate a motor service. This road would be about 140 miles long.



Proposed Road Scheme for Fukien Province

In the vicinity of Foochow over 30 miles of macadam roads have been built by the Foochow road bureau, headed by Mr. Lin Ping-chan, the representative of the Chinese government on the Min River conservancy commission. The cost of these roads was $325,484 (Mexican), or an average of $10,636 per mile. A motor passenger and freight service is maintained by the Yen Fu Chuan Company, a semi-official concern in which the provincial government holds a large block of stock. This company is operating six motor cars and seven buses on three regular routes. It holds the monopoly right to build roads and operate motor bus services from the capital to Yenpingfu and from the capital to Chuanchow. The projected road to Yenping up the valley of the Min River, about 100 miles long, is undoubtedly one of the most important in all China as down this route comes the great commerce from the interior, and while such a road could not hope to compete with the cheaper river transportation, it will materially shorten distances by the saving in time. The Foochow-Chuanchow road has been made part of the provincial coast road plan, as outlinedabove.

Our correspondent in Fukien, describing the progress of the province, says that one remarkable advance at Foochow has been the opening of the horse road from the end of the long bridge (Wan-shou Ch'iao) to the city, and on into the heart of the city. This shows how thoroughly the old bondage to *feng shuei* is broken. The south gate was the dragon's mouth, and the white pagoda on the east and the black pagoda on the west were the dragon's horns. The ground in and about the south gate was so low that in case of a flood in the river it would be overflowed to a depth of one to five or even to ten feet.

The horse road was begun in the fourth year of the republic and was finished in the seventh. It first turned east from the head of the long bridge till it reached the outside of the suburbs, then pursued a general northerly course for about two miles, then turned west till it reached the water gate by which it entered the city.

From this point it was extended into various parts of the city. It was finished in the seventh year of the republic, was soon well supplied with rickshaws, and much patronized by the well-to-do. But all foot travel between the city, the south suburbs and the foreign community went by the shorter south street; and then this also was opened to the horse road. A gap was made right through the city wall on the east side of the south gate, the low ground in and about which was filled up till the gate was closed to all travel. The shops facing on the street retracted their fronts to make a street wide enough for three autos to go abreast; and now horse carriages and autobusses dash along the once sacred south street. The rickshaws also run out through the west gate up to the Upper Bridge (Yun-shan ch'iao); and in time they will be running down the river to the anchorage.

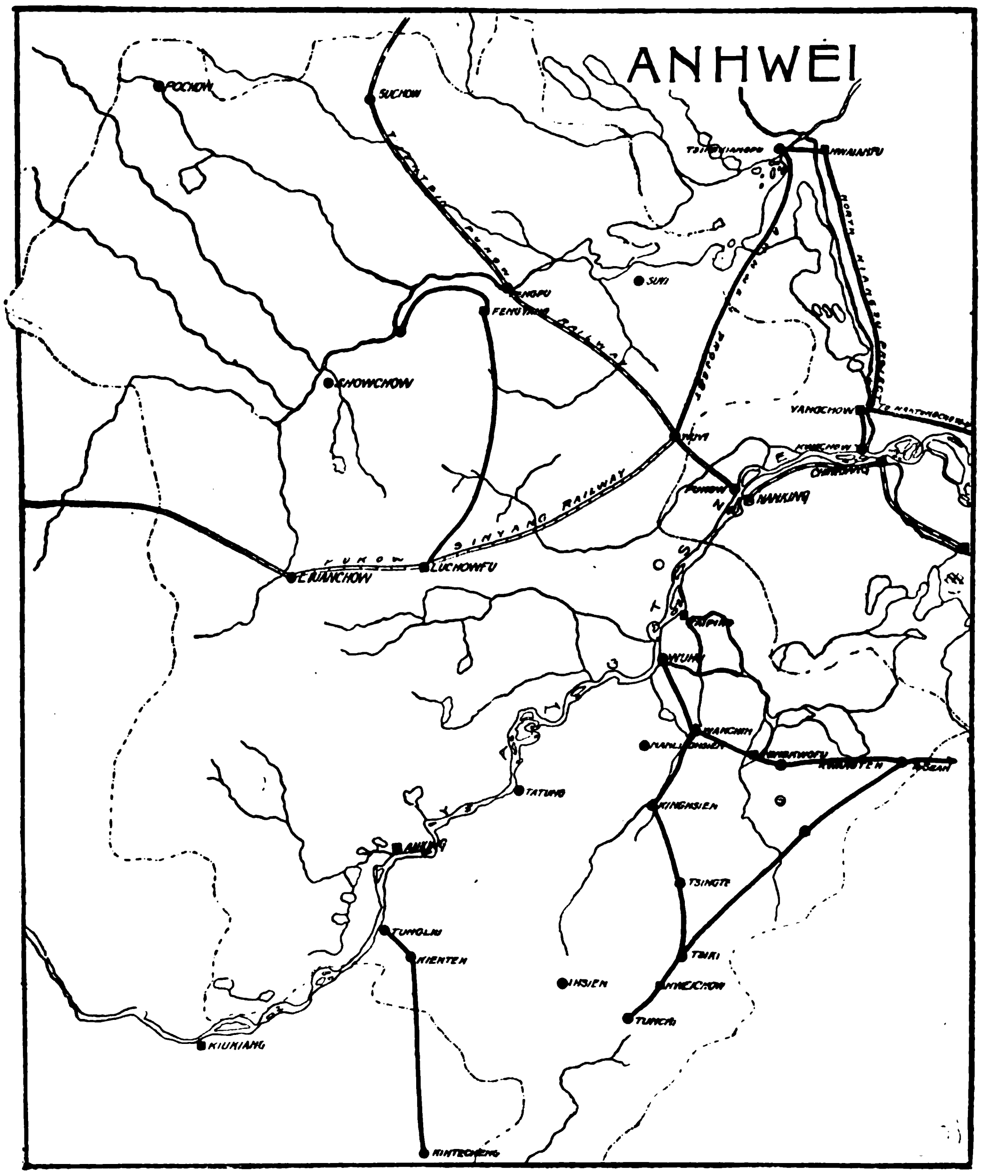
There is talk of a highway to extend clear across the province to the head waters of the Min, and then from there over the divide

into the Kiangsi province. This will come when the country is united again under one good government. The influence of the waterworks, electric lighting and widened streets is felt all through the Min Valley; and beginnings along these lines have appeared at various points in the interior. The whole province is rich in water power, now all running to waste. But the old superstitions are breaking down; and the people are ready. All now waits on capital; and capital waits for confidence in an established government acceptable to the people.

Hinghwafu.—Hinghwa is also to be made the centre of a system of country roads radiating in all directions and making connections with the sea-port and the principal cities of this region. Already certain taxes are specified for the carrying out of the project. The scheme contemplates the construction of about a hundred miles of road and if carried out will be of great value to this section.

In **Yungshun**, a broad street thirty feet in width was built through the chief business centre of the city requiring the pulling down of a strip of shops ten feet wide on either side of the former street. The road in Yungshun has been built on into the country until ten or fifteen miles have been completed.

Changchowfu.—In this city the Sze Shun Automobile Transportation Co. has been organized to run a service on the newly-built provincial roads and also on roads being built. Changchow will be chosen as the central station, leading to Shihma on the southeast, a distance of 35 *li*; to Tienpaohsu on the northwest to Nanchinghsien, 35 *li*, and to Nanhsu on the north then turning eastward to Changtaihsien, 30 *li*, aggregating 100 *li* in length. Transportation service from Changchow to Makowjao via Fengjenmue, a distance of 35 *li* and from Fengjenmue to Chenchee, 10 *li*, is also under contemplation.



Some Proposed Roads in Anhwei Province

Some of these roads are merely local sections of the provincial scheme. From the southern terminus of the Fukien coast road at Yunsiao another highway is now under construction that will carry it down into Kwangtung through Chaochowfu to Waichow, where it will link up with the road to Canton. Part of this road has been completed and opened to traffic.

Anhwei Roads.—The road program for this province is not so elaborate perhaps as some of the other more important sections of China, but such as it is, it will open up some of the most prosperous districts of China and in connecting with the Kiangsu system will bring communication with Shanghai and neighboring provinces. The plan as passed by the provincial assembly provides for the present of four main roads on which motor services will be operated. These roads will connect Wuhu with Tunchi, Tungliu with Kintechen in Kiangsi, Hueichow with Sean in Chekiang and Wuyi with Tsingkiangpu in Kiangsu.

The Nanyang Brothers Tobacco Company at Liufuzi in the Fenyang district will build an automobile road from Mentaitze to Liufuzi and, if the necessary funds can be raised, the road will be extended to the city of Luchow.

Hankow

Hankow probably presents the best picture of motor traffic possibilities stifled by Chinese obstruction and apathy. With only twenty-five miles of roadway, including cross streets, and of which 20 miles are located in the foreign concessions, this port has 172 licensed passenger cars, which include five motor trucks, two of which belong to the Chinese post office. In 1912 there were three cars, while in 1920, 47 cars were imported valued at $67,202. Notwithstanding the restricted mileage of streets the use of cars is becoming more and more extended, but no great development can be expected until further road additions are made. Across the river is located the large city of Wuchang, the capital of the Liang Hu, or the two great provinces of Hupeh and Hunan, next to Tientsin the most important government seat in China. Yes because of the lack of roads, the immensely wealthy Chinese officials have as yet purchased no cars. The same is evident in the neighboring city of Hanyang. Not a car or a truck to be seen. While all other important provinces in China are devoting some study to the planning and construction of roads, the Liang Hu government has ignored to date this most essential step in the development of its resources.

Modern Road at Woosung

Owing to favorable weather, the construction work on the new road along the Woosung Creek, Woosung, under the auspices of the Woosung port works bureau, has made rapid progress and the first section completed before the time limit. At the sides of the newly built road trees will be planted.

A Modern Chinese Road and Transportation Company

The Shanghai-Minhong-Choling Automobile Transportation Co., Ltd.

AT the present there are four road and automobile companies organized for operating out of Shanghai. The first of these, The Shanghai-Taichong Automobile Transportation Company, with general offices at Tai Teh Lee on Carter Road, under the management of Mr. Hung Pey-yen, commenced operations on January 1, on a thirty *li* (ten miles) section between Chapei and Lutien. This service has five new American buses accommodating 10 first and 16 second-class passengers, which cost Tls. 4,500 each. As the road is extended, additional cars will be added. There is also the Shanghai-Nanhui and the Shanghai-Chuensha Automobile Transportation Companies, with offices at Tsing Yuen Lee on Peking Road, jointly managed by Mr. Mo Sze-chai. The latest progress reports of these roads state that after two months of work on the Shanghai-Nanwei automobile road, the section from Chow-chair-doo to San-ling-dong has been completed and it is generally believed that at the end of the year the road will reach Chow-poo. Work on the two cement bridges known as Hung-dah-jao and Sun-chiar-jao has been started. It is expected that service between Chow-chiar-doo and San-ling-dong will be inaugurated within the year, while through traffic on the whole line will be possible by the end of April, 1922.

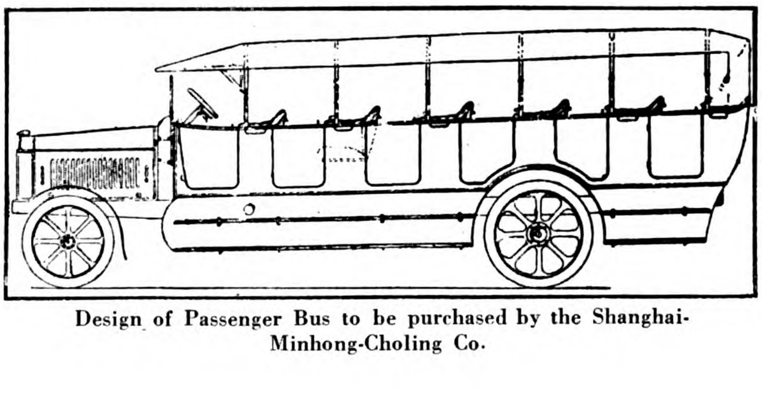
Major-General Li Ying Shih
General Manager of the Shanghai-Minhong-Choling Automobile Transport Co., Ltd.

With regard to the automobile road from Shanghai to Chuensha, great progress is also being made in construction work. The capital of the Company has been fully subscribed and surveying from Ching-ning-sze to Yee-chiar-jao completed. Work on two large cement bridges named Mar-chair-pang-jao and Dao-kiu-jao, will soon commence and are expected to be finished next March. The road will have a width of 40-ft. except at the most prosperous section from Ching-ning-sze to King-chiar-jao where it will be 50-ft. wide.

Full particulars regarding the capitalization and estimates of these three companies are not as yet available but we may take as typical of the many new road and auto transportation companies operating, projected or in process of promotion in China, the Shanghai-Minhong-Nanhui-Choling Automobile Transportation Company, Ltd., organized in Shanghai and registered with the ministry of agriculture and commerce in Peking, and at present actively engaged in pushing through its construction work. The estimates of costs and revenues of this company provide an excellent idea of similar enterprises in the Shanghai and adjoining regions and with allowances for variations in land costs, number of bridges and surfacing, will serve as a general guide for the rest of China. The most important commercial openings are for the sale of motor vehicles, steam road rollers, steel for reinforced concrete bridges, corrugated iron drains of the type employed in large quantities in America and elsewhere for road work, surveying instruments and private telephone installations. From the cross section of the road, it will be noticed that in this alluvial plain where stone is at a premium, surfacing is to be done with ashes, presumably to be collected in Shanghai.

The proposed road will start from the Wang-chia-Chiuh road on the outskirts of Shanghai and pass through Chin-kung-tang, Chaoho-ching, Lunghwa, Sin Lunghwa, Mei-chia-lung, Chu-chia-hong, Ong-pan-chao, Chan-chao, Pei-chao, Minhong, Tai-pin-shang, Hsiao-tang, Nan-chao, Sintze to Choling on Hangchow Bay, a distance of 95 *li* or approximately 32 miles. The capital of the company is $500,000 (Mexican) divided into 10,000 shares of $50 each. The general manager is Major-General Li Ying-shih, advisor to the civil and military governor of Kiangsu, military commissioner of Shanghai, ex-defense commissioner of Shanghai, commander of the 3rd mixed brigade, etc., and amongst the promotors are such well-known names as Mr. Li Ping-shi, Chang Yiuh-chu, Yao Tze-chang, Mo Tze-ching, Chien Sin-chu, Loh Sung-han, etc.

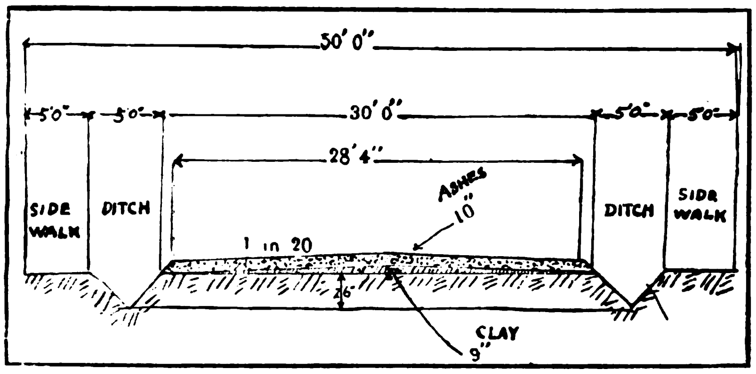
The company will operate 20 passenger cars making ten trips daily between Shanghai and Choling carrying 24 passengers each trip at a fixed fare of 30 cents each from Choling to Tai-ping-shang, the station on the bank of the Whangpoo opposite Minhong. From Minhong to Shanghai the fare will be 30½ cents. This gives a possible total daily revenue of 20 by 24 by 10 by .605 or $2,904. On this basis, the company's prospectus says that a daily profit of



Design of Passenger Bus to be purchased by the Shanghai-Minhong-Choling Co.

$1,560 is possible, which, although not stated, would indicate that the estimated daily expenses is placed at $1,344. The prospectus holds out the expectation of an annual "net profit" of $103,253 after deducting all charges, dividends, etc. The rate of dividend is not given. In addition, the company will operate four freight motor trucks making four trips daily between Shanghai and Choling. The tariff is fixed at $6.00 per trip, or a total of $96.00 per day income from this service. Special cars will also be provided for special trips at higher rates. The passenger cars are estimated to cost the company $7,000 each and the trucks $5,000 each.

These cars, illustrated on the preceding page, are to have a gasoline efficiency of 8 miles to the gallon; 30 h.p.; speed, 20 miles per hour; weight 2 tons; capacity 25 persons; height of car, 6½-ft.; width, 7-ft. 3-in.; length, 18-ft. 3-in.



Sectional View of Shanghai-Minhong-Choling Road

Note.—The drainage ditches are to be placed outside the Side-Walks.

(It was reported in the native press in the latter part of December that this company had recently placed an order with Leewoo, a German firm, for ten passenger and freight cars, the former to cost Tls. 2,700 each and the latter Tls. 2,750 each. The cars are expected to arrive in Shanghai in April next. "Leewoo" is the Chinese hong name of Carlowitz & Company, one of the most prominent German firms in China. It has been impossible to corroborate this report.)

In addition to the cars, the company will construct two steam ferry boats at a cost of $4,000 each for the passage of the Whangpoo at Minhong. There will be 14 stations along the route. The number of employees is placed at 12 mechaniciens, 48 chauffeurs (2 for each car), 44 on the road maintenance gang, 2 launch assistants, 2 launch captains, 2 deck hands and 40 road police.

Expenses.—Further light on the costs attached to road building and operating these native transportation companies is given in a separate itemized statement as follows:

Cost of Land.—917 *mow* (one *mow* equals .15182 acres) of land will be required for the entire length of road, estimated to cost $62 per *mow*, a total of $56,854. The Shanghai station site will cost $2,500. With other expenses and allowances for the removal of tombs, the total cost of land is placed at $76,000.

Earthwork.—A total, of about 42,480 *fong*, is estimated as necessary for filling, grading, etc., costing about .33⅓ cents per *fong*, or a total of $14,160.

Surfacing.—The road is to be surfaced with a layer of ashes 10 inches deep over an area of 31,500 *fong* of road. At .70 cents per fong including cost of collecting and wages to coolies, this item will total $22,050.

Bridges.—29 reinforced concrete bridges with a total of 480 sq. feet of surface are provided for, the estimated cost for which is placed at $220 per square feet, or a total of $107,900.

Automobiles.—20 passenger cars at $7,000 each, $140,000, and four trucks at $5,000 each, $20,000, a total of $160,000.

Buildings.—14 stations will be built. The four larger stations at Shanghai, Minhong, Taiping and Choling are to have warehouses and dormitories attached and are estimated to cost $26,000, while ten sub-stations will cost $500 each, a total of $31,000 for buildings.

Ferry Boats and Jetties.—For crossing the Whangpoo, two ferry boats costing $4,000 each and two landing stages at $5,000 each will be required, a total of $18,000.

Tree Planting.—Over 24,000 trees will be planted along the road calling for an expenditure of $1,000.

Furniture and Fixtures.—Telephones, allowances to police stations for additional policemen, surveying instruments, furniture and fixtures for the various stations and offices are estimated at $20,000.

Steam Road Roller.—A 9-ton steam road roller at $10,000.

Training School.—A fund of $1,270 is set aside for a training school for motormen, but prior to its opening, applicants will be sent to the school established by the Shanghai-Taichong Automobile Transportation Company.

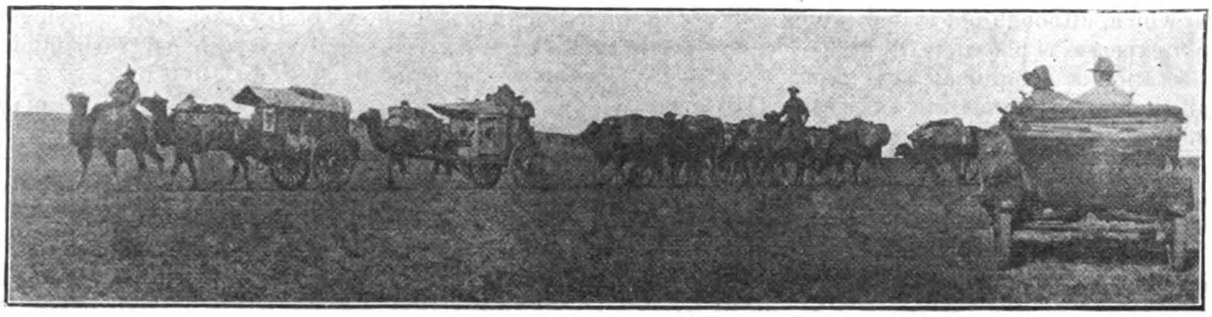
Reserve Fund.—To provide for deficits in the above itemized estimates, a sum of $36,620 is set aside. Total, $500,000.

If the above estimate be taken as a guide for the volume of new business created for foreign automotive manufacturers, it would be fair to say that the sum of $210,000 roughly represents the initial value of orders for automobiles, accessories, road rollers, drains, reinforced concrete steel, surveying instruments, telephones, building hardware, tools, machine shop equipment, etc., or, about $7,000 ($3,500 gold) per mile. This would not include the follow-up and permanent demand for spare parts, repairs, tire renewals, gasoline, oils, grease and the replacement of worn-out machines in three or four years. It does not represent the possibilities that might be created in other parts of the country where rock is abundant for stone-crushing plants.

Opportunities for Road Making Machinery

It has been commonly accepted that under no conditions can the many labor-saving road-making machines compete with native coolie labor, and therefore the market holds out no inducements for such equipment. In a general way this holds true, but we have witnessed many instances where the reverse is also true. In certain sections of China, perhaps the time will never arrive when labor-saving machines will supplant the coolie, but we are becoming convinced that the old idea about coolie labor is a fallacy, and as China develops and the element of time is more and more taken into consideration, a market will be developed for up-to-date road-making machinery. We believe that the time is opportune for an intelligent study of these conditions on the part of the road machinery manufacturers, by practical tests on the ground. The Chinese, of themselves, will never take the initiative in this matter, and if a market is to be created for modern road-making machinery, the manufacturers should either individually or in combination send out some of their specialties and demonstrate upon the ground what can be done, especially in the saving of time. With large Chinese companies operating with big capital, the element of time will undoubtedly be given due consideration, and once it can be demonstrated that such machines can compete favorably with the native labor, a large and profitable market will be opened. But it will take time, patience and initiative. Like every other success in China, a few years of missionary work will have to be carried on without profits, in order to educate the Chinese. Experience tells us that once these most practical people are satisfied that these machines are applicable and profitable, they can be depended upon to order them in increasing quantities.

The North Manchuria Automobile Co. is being organized by Mr. Chi Hung-quan at Harbin to run a regular service between Harbin and Tsi-Tsi-Har via Suiyuan, and Charhar. Seven cars have been already purchased.



The Old and the New; Camel Carts passed on the Way to Urga

The Opening of Mongolia by Motor Vehicles

THE conquest of the Gobi desert will remain as an epic in the annals of motor transportation. Pluck, energy, resourcefulness, suffering and adventure have been the outstanding features of the many heart-breaking attempts to open up this vast inland waste to modern commerce. Many articles have been written describing the pioneer expeditions into this inhospitable territory, opening up the road from Kalgan to Urga and west from the rail head at Fencheng or Suiyuan to Kwihwacheng and across the desert to Urumchi. The necessity of rapid transportation between Kalgan and Urga, the Mongolian capital, and thence on to Kiachta and the Siberian railway has provided the Russians with many pretexts for devising plans for strategic railways designed for the domination of Peking and striking at Japan in South Manchuria from the rear in Eastern Mongolia. However, these railway schemes fell through, and the conquest of Mongolia devolved upon the automobile. In 1913, the Mongolian Trading Company, a subsidiary of an American firm (Andersen, Meyer & Company), pioneered the way with a monthly service of Ford cars between Kalgan and Urga. Although the activities of the various companies in opening Mongolia to motor traffic have been very fully described in previous numbers of THE FAR EASTERN REVIEW, we extract from a recent article written by Mr. Verne Dyson for the *China Press* the most up-to-date facts on this subject. Mr. Dyson, in describing the operations of the northwestern motor service, says that about five years ago Major-General Tinge Si-yuen, then managing director of the Peking-Suiyuan Railroad, suggested to the ministry of communications that the government should consider the building of a railroad between Kalgan and Urga, a distance of 672 miles, as a military precaution in the event of a revolt in Outer Mongolia, but the government could not finance it and the plan was given up. Then the general suggested a motor service between Kalgan and Urga. Enough money was available to buy five or six motor cars and so the line was established under the guise of a strictly business enterprise when, in fact, it was a military measure.

At this time the automobile was not entirely unknown to the Gobi desert region for in 1913 the Mongolian Trading Company, an American concern, began operating a monthly service to Urga, using Ford cars. This line was still in operation at a late date but with its energies confined strictly to company business.

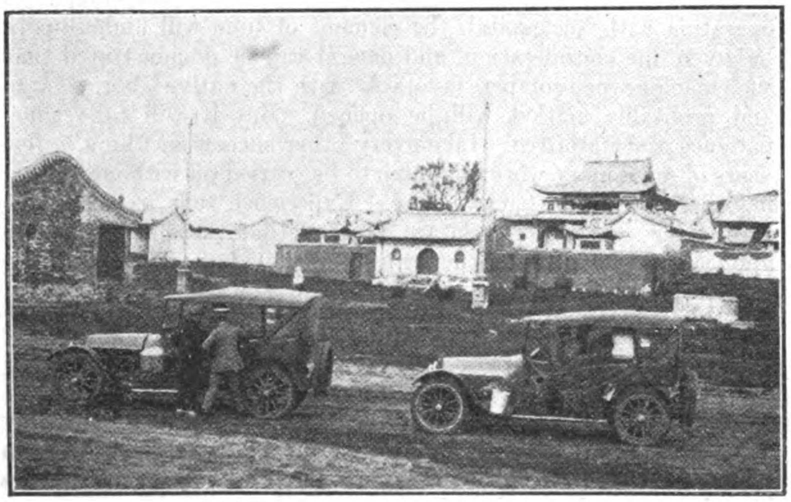
Then in 1915 the Chinese Merchants Motor Car Service began transportation across Mongolia. For a while two or three Ford cars were dispatched from either end of the route every ten days. Heavy trucks were tried on this line but without success. After three years the company suspended, due to a breakdown in management and scarcity of money.

The government's project, the north-western motor service, came into being in the summer of 1917. Mr. Y. C. Loo, the superintendent, started on his path-finding trip on June 16 with a fleet of five Buick touring cars (six cylinder). The operating force consisted of two mechanics and seven drivers. There were several government officials, including Mr. Yu Yen-feng, now managing director of the Peking-Hankow Railroad and then an engineering expert with the ministry of communications. Mr. Yu had his secretary and there was another engineer, Mr. Huang.

On this initial tour the principal cargo of each car was gasoline. Aside from its regular tank, each machine had a forty-gallon tank on each of its two running boards. One car carried twenty-three 10-gallon cases of gasoline.

The first lap of the journey was Kalgan to Pang Kiang, 147 miles.

The expedition remained in Pang Kiang three days, repairing, testing and tuning-up. Made Udda, the next stop—119 miles—by 8 p.m. on the first day without mishap.



Lama Temple near Top of Plateau, about 40 Kilometres from Kalgan

Near the Top of the Plateau

Between Udda and Turin part of the road was missing. There was no serious trouble, however, and the distance of 114 miles was covered before dinner time. It is a short run between Turin and Urga, only 89 miles, and the destination was reached at 4 o'clock in the afternoon. There was a stay of one week in Urga before the return trip began.

Thus was the north-western motor service inaugurated. On August 5 three cars started from Kalgan with seven passengers. The cost of a one-way ticket was $120, and each passenger was allowed a maximum of twenty catties (thirty pounds) of baggage.

The three cars brought back twelve passengers and business continued to be good. When the traffic was suspended on October 10 on account of the cold weather the line had made a net profit of $4,000. The government was pleased and Mr. Loo was sent to Shanghai to buy more cars and a vulcanizing plant.

Five more Buicks were placed in service when the line resumed operation in March, 1918. By that time Mr. Loo had established a repair shop and a vulcanizing plant. The garage, the first in Kalgan and the most northern institution of that kind in China, was established in a remodeled railway godown. There was room to store thirty-five machines.

From Shanghai Mr. Loo transported considerable machinery for the repair plant. The equipment included a lathe, drill, planer, shaper ; a Delco light plant for lights and for battery service ; and a compressed machine. Being a motor car-engineer, Mr. Loo took pride in making it a model garage. He had seven mechanics.

On the first trip of the 1918 season there were twenty-two passengers and business continued to be good up to October when traffic was suspended. A total of eighty tires and twice that many inner tubes were worn out that season. The net profits for the months were $25,000. Again, the government was pleased and Mr. Loo was directed to buy more Buicks and he added eight to the string. It was decided to operate the line all through the winter of 1918-19.

"We managed to keep the cars going all winter although it was from thirty to fifty degrees below zero for about four months," Mr. Loo explained. "Under these conditions motoring reaches the maximum of hardships. In the radiators we used a mixture of half alchohol and half water. In cold as intense as this the engines had to be kept going continuously, even at night when we were not running. We had to have a guard who stayed awake all night and kept the engines running slowly. You can imagine the difficulties of starting an engine when it has cooled to 50 degrees below zero."

During the winter three to five cars left Kalgan for the north every ten days. The total income for the year, ending with October, 1919, was $140,000 and of this amount, $80,000 was clear profit. Once more the government at Peking was pleased and again Mr. Loo was directed to buy more cars. In the fall of 1919 he purchased twelve 7-passenger Buicks. There was now a total of twenty-four cars in operation.

Immense profits were expected from the line in 1920, but early in that year began the revolt in Outer Mongolia. By April all commercial passenger service had been suspended and the entire equipment of the line was devoted to transporting the soldiers of General Hsu Shih-cheng ("Little Hsu"), the commander of frontier defense.

All through that summer the motor line was devoted to military uses. When Baron Ungern took Urga he confiscated three motor cars belonging to the government's motor line.

While the Peking government was frantically engaged in transporting troops across Mongolia, eighteen one and two-ton trucks were purchased to augment the touring cars. The trucks were found to be too heavy for the roads and their use was discontinued after only four trips.

All through 1921 the equipment of the motor line, costing a total of about $250,000, has remained idle at Kalgan with the exception of passenger service which has been maintained between that place and Dorlonor, the distance of 300 *li*, and without profit.

For more than one year the hostility of the Mongolian officials in Urga and the numerous bandits along the northern part of the route have made it impossible to operate the line, but these conditions have changed now, it is said, for the better.

The Packard Record

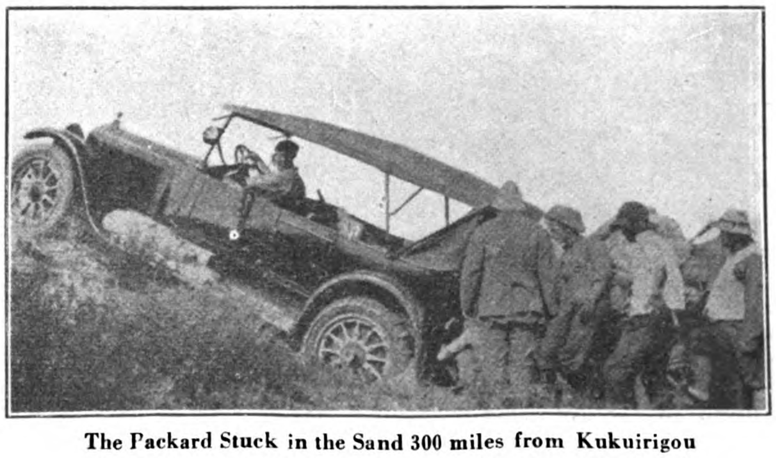
Although the Ford and Buick machines played such a prominent rôle in the opening of communications with Urga, their exploits were eclipsed later on by the daring trip of Lieutenant George Moskovski of the Polish army in shoving through over 2,000 miles of desert between Fenchen and Urumchi the capital of Chinese Turkestan, with two Packard twin sixes hauling trailers, and returning over the same distance to their starting point. The caravan that started on this epoch-making trip consisted of two Packard cars, one Pierce-Arrow 2-ton truck, with a four-wheel trailer, a Broadway truck with a two-wheel trailer, an Empire sedan, an Empire touring car and a Ford. This expedition started out to prove that motor transportation was possible and that goods could be brought from the interior to the market in a much more efficient manner than could be obtained through the use of camels and other beasts of burden.

The roads ended at Kweihwacheng, and three cars and the two trucks were forced to put back. The two Packard twin sixes, however, continued. Both carried trailers. They were followed at several days interval by camel trains which carried supplies for the return trip as gasoline stations are not exceptionally numerous in Western Mongolia. Long stretches of deep sand added to the difficulties of motoring, and in one instance, the sand was so deep that one of the trailers had to be abandoned. At a point about 700 miles west of Kukuirigou, and 300 miles north of Kanchow the motorists found themselves confronted by a long range of mountains and sand hills through which the guide was unable to discover a pass. As this region was the very heart of the desert and practically uninhabited, there was no one to turn to for further information, and the few natives seen fled precipitately from the "devil wagon." Eventually, a pass was discovered and the party proceeded.

In spite of the handicap of the trailers the two cars finally reached Urumchi about two months after leaving Tientsin.

The actual traveling time was, of course, but a small fraction of this period. The same hazardous features were encountered upon the return trip.

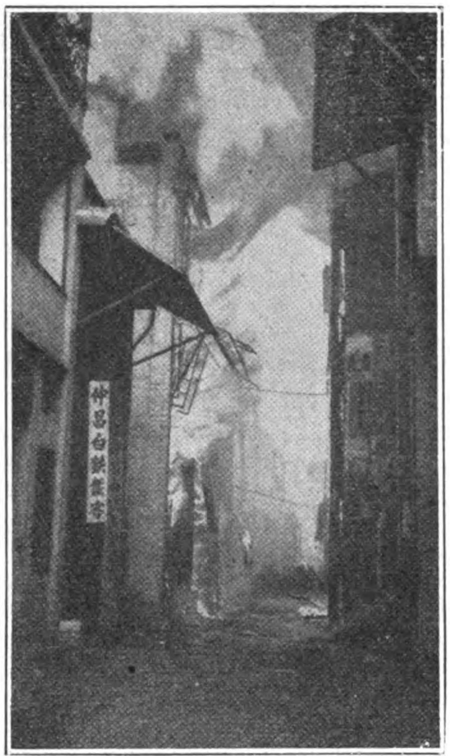
The trip proved that while it is entirely possible to substitute the motor car for the "ship of the desert," the old methods will likely continue for some time, as only a car of the very highest quality and with a super-abundance of reserve power can stand up under the trying conditions of the trip.



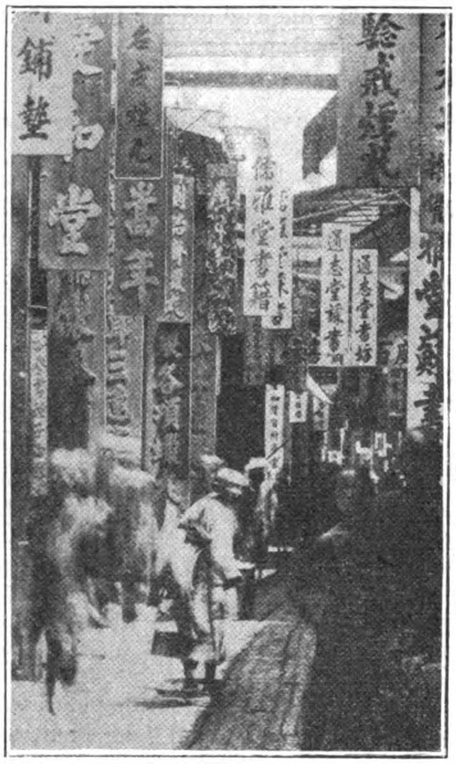
The Packard Stuck in the Sand 300 miles from Kukuirigou

Canton's New Maloos

No other city in China proper can show the results of clean government in good roads and streets as the capital of the southern republic, where, under the stimulus of Dr. Sun Yat-sen and his son, Mr. Sun-fu, the mayor of Canton, a group of young western-educated engineers are making a record for themselves that will stand as an example of what can be done in China under an honest administration. Although much of the credit belongs to those higher up, the actual work of reform is being carried out by a group of earnest young men whose names do not always appear on the plans and other official documents given out for publication. The work of improvement goes back to the early days of the revolution, when General Chen Chiung-ming, acting governor-general of the province, approved the scheme of Mr. Cheng Tien-tow, a graduate of an American school, then head of the public works department, to tear down the old walls to provide space for new roads. Some progress was made in this direction, when the reactionary Gen. Lung Chi-kwong assumed control of the government, and ordered the walls to be rebuilt with the old materials. When this northern satrap fled and the new element returned to power, a municipal council was formed to take measures to build streets and lay out parks, and Mr. Lun Wan-sheung, an English B.Sc., engaged to act as chief of the public works department. However, another change brought Mr. H. L. Wu into the direction of this office and under his supervision most of the actual work has been carried out. Mr. Cheng Tien-tow and his associates, Mr. R. C. Johnson, now chief engineer of the Canton-Samshui Railway, and Mr. H. L. Wu mapped out the work. The present director of public works, Mr. H. L. Wu, received his technical education at the Ohio Northern University and University of Illinois, U.S.A., and on his return in 1911 joined the Canton public works, then under T. T. Cheng, as engineer, resigning in 1915 to join the American section of Szechuan-Hankow Railway.



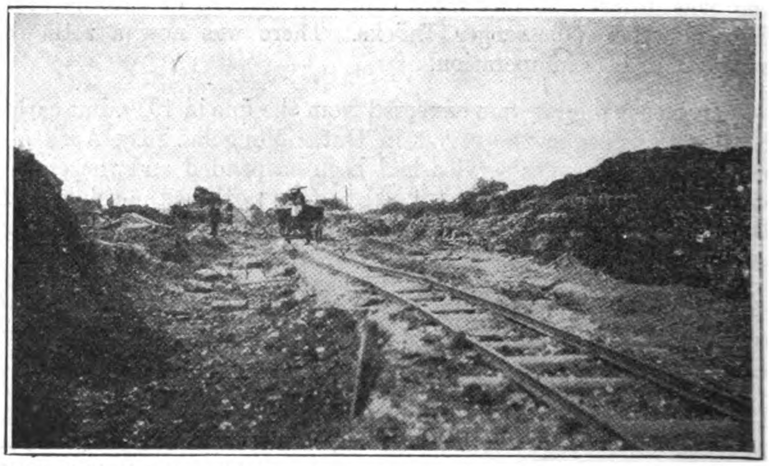
A Fire in Canton's Narrow Streets. Fires are frequent in Canton and give the Government a chance to rebuild the burned districts along modern lines



Canton's Famous Streets, now giving Place to the less Picturesque Paved City Street

Mr. Wu is a charter member of the Chinese Institute of Engineers and a consulting engineer of the Koushing Engineering Co., a concern composed of the well-known Chinese mining engineer Mr. C. S. Lowe, and Mr. Peter Soohoo, an associate member of American Society of Civil Engineers; Mr. G. Y. Fong, an electrical engineer, and some other experienced engineers in that city. In 1912, after the big fire in Canton, Mr. Wu introduced many modern streets among which are an important portion of the Wing On avenue, the West Bund and the Cooper Island, Tai Sha Tau. He directed the survey party and planned out the reclamation work of the island in 1913.

Co-operating with Mr. Hu are other bright, forward-looking, hustling young Chinese in charge of other municipal departments. Directing the public park bureau is Mr. Yeung Sik-chung, a B.A. graduate of the College of Architecture, Cornell University. If his plans carry through Canton will have five public parks. The chief of the land department of the Canton municipality, Mr.



TEARING DOWN THE OLD WALLS OF CANTON

Six miles of wall containing 800,000 cubic yards of masonry and dirt were demolished to make room for broad new highways along which rush the modern motor car and autobus

A Broad New Maloo in Canton

On the Way to the City Yamen

Luan Chang, is a graduate of the Tangshan Engineering College, an M.S. from the University of Illinois, gaining his practical experience as designer with the Baldwin Locomotive Works and as ordnance designer with the Bethlehem Steel Corporation. Before joining the municipal government he acted as technical adviser to the Kwangtung Arsenal. At the head of the fire department is found Mr. Chue Yue-tat a bright and active young engineer who is bringing his department into line as rapidly as finances will permit. In Mr. Chen Chung-ming, the city of Canton has acquired another live wire as chief surveyor. These young men, working in close co-operation with Mayor Sun-fo, are rapidly transforming Canton from the "City of the Awful Stink" into a place fit for human beings to live in.

The demolition of the walls gave employment to over 6,000 laborers working under nine contractors who were awarded the contract in sections. The total length of the old city wall was nearly six miles with an average height of 24-ft., a width of 43-ft. at the bottom and 35 at the top. The wall around the new city was 15-ft. high, 17-ft. wide at the bottom and 13-ft. at the top. The work of demolition involved the removal of some 800,000 cubic yards of masonry and dirt, and was commenced in December 1918. With this as a start, the work of road building has gone on apace, and under the rule of the Kwangsi military government in 1919, the old wall disappeared and 37,000-ft. of broad highway was constructed. This good start was continued under the new administration which has to its credit a further 30,000-ft. of avenues with another 50,000-ft. under construction. The plans call for the extension of the bund around the Shameen island and the gradual extension of the wide street system over the entire city and into the surrounding country. In extending the city limits great difficulties have been experienced in the removal of millions of graves. Only in this manner could proper provision be made for the living, and much new and valuable building land has been made available. In connection with the street system goes the creation of parks, playgrounds for the children and tree planting. One public garden has been completed and three more are awaiting necessary funds for development. The plans also call for the sale of all the old official yamên sites and with the funds so obtained a new civic centre will be erected in which all of the municipal and provincial government offices will be housed. The American influence is again seen in this new departure, as the work has been entrusted to the well-known firm of American architects, Murphy & Dana, the designers of the Rockefeller Foundation at Peking, the Yale in China at Changsha, and other important buildings.

With the construction of wide streets the automobile, auto bus and truck have made their appearance in large numbers. Within a few months after the opening of the new roads over forty motor cars and a motor bus service were in operation in a city which for centuries had been practically closed to wheeled traffic. Each month sees some new advance in road building and the extension of motor car and bus services.

By July of last year, or within a little more than twelve months after the opening of roads in the city, 125 motor cars were registered with the Canton municipal government, and many road and auto bus schemes are now on the tapis and gradually assuming tangible shape. One of the motor bus lines in Canton is operating 15 F.W.D. trucks manufactured by the Four Wheel Drive Auto Company of Clintonville, Wis. These trucks are equipped with passenger bodies made in China, each truck hauling a trailer, the combined seating capacity being 70 persons. A motor road has been proposed to connect the city with the famous Loh Fo Hills which will cost $150,000 to construct. With the proceeds from the sale of public

The Motor Bus lines now Competes with Canton's Rickshaw and Chair Coolies. There are several of these lines running a regular service along Canton's New Maloos. The Fare is Ten Cents, Silver

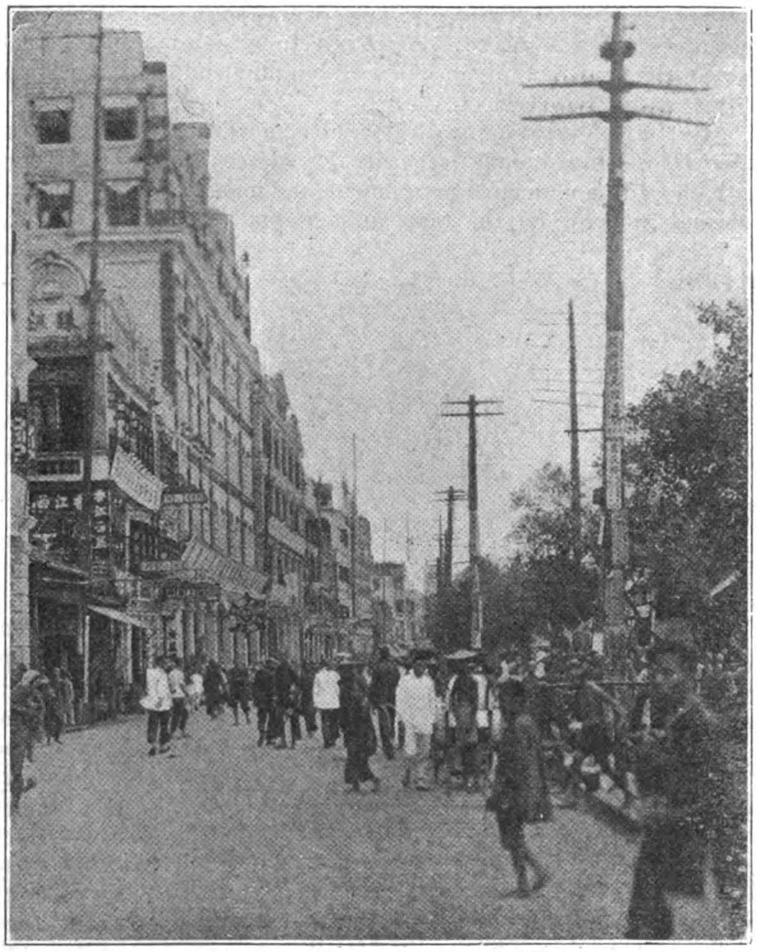
properties and a sum of $100,000 from the provincial treasury the public works department called for tenders in July for the construction of the uncompleted sections in the first road system including the Pan Fook Maloo, the great South Maloo, the Yet Sou Central and the Mun Ming Maloo.

By December witnessed the completion of the extension of the Yuek Shau Maloo, 6,000-ft. in length, connecting the Ta Sha Tau station of the Canton-Kowloon Railway and the northern section of the same highway.

The survey of a road from Canton to Tsing-Sing district is now finished. The road will start from Sha-hoo, outside the east gate, *via* Inn-tong and through the foot-path of the white cloud mountain directly to the district of Tsingsing, a distance of sixty miles.

The public works department has issued an announcement that several maloos will be opened in Saikwan in order to facilitate communications in that part of the city. Starting from the western end of Sap Sam Hong Street, a 40-ft. maloo will be built to the eastern end of the street with a 10-ft. sidewalk on each side of the maloo. Another maloo of the same width will connect the west bund and the present Sap Sam Hong Street. The Wing Yang Street and the Tak Cheng Street will be widened to 20 and 24-ft. respectively. The above schedule has been approved by the executive council of the municipality and surveying is going ahead.

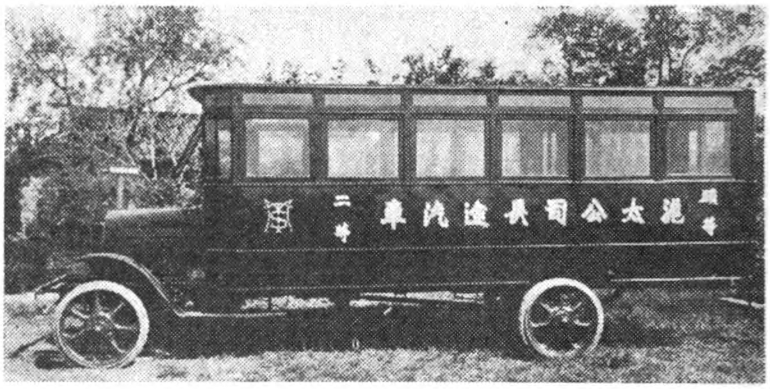
That Canton is awake, spurred onwards by the zeal of young China to show the world that they can do things, is attested to in many other directions. Communications and public works are receiving all the attention and revenue that is not diverted to the military campaign against the north. At the request and under the authority of the provincial assembly, the city engineer is now working out the plans for a steel bridge over the Pearl River to connect the city with Honam that will cost $2,500,000.



The New Bund, Canton, A Magnificent Avenue

Shanghai-Taitsang Motor Service

THE first 'bus of the Shanghai-Taitsang Motor Service Co., Ltd., made its first journey on January 1st from new Kung-ho Road, Chapei, to an intermediate station called Tazang, 18 *li* (six miles) from Shanghai.



Type of Autobus on Shanghai-Taitsang Service

For the first week the trips will be, more or less, trials for the new service which will later extend to a suburb of Taitsang called Liuwu, a distance of about 72 *li* (24 miles) from Shanghai. Work on the road between Shanghai and Liuhu has been finished but there are still several bridges in course of construction which need to be completed before the through service starts. This road is being built by the Paoshan district authorities and rented to the Shanghai Taitsang Service Co. is about 30-ft. wide. It is estimated that the cost will not be less than $300,000, which sum has been paid by the company as a franchise fee. There are about 40 bridges altogether and nine stations, namely, Shanghai (Chapei), Panpoo, Tazang, Tongchao, Liuhong, Lootien, Pankiachao, Zauchinchao and Liuwu.

The motor-buses to be used are of American make, especially suited for the local conditions. At present there are four large carriages and four small ones. They cost approximately $4,000 each. When business improves later on, the company expects to be able to attach trailers. The larger carriages seat 30 passengers and the smaller ones 15. The present cars are divided, like the ordinary tramcar, into two compartments, the first and second classes.

Fares are as follows:—

Shanghai to Panpoo—
First class 15 cents.
Second class 10 cents.

Shanghai to Tazang—
First class 30 cents.
Second class 20 cents.

Pampoo to Tazang—
First class 15 cents.
Second class 10 cents.

And *vice versa*.

It is expected that the through service to Taitsang will be started about three months hence.

The Shanghai-Taitsang Motor Service Co., Ltd., was formed last year by Mr. Hung Pah-yuen, an ex-Shanghai district magistrate who is the present chairman of the board of directors, Mr. Tsu Hai-shu, general manager of the company, and a number of other Chinese. It is purely a commercial company and has an authorized capital of $500,000, $300,000 of which has already been paid up.

Road Construction in China

SUCH data as is available for estimating the cost of road building in China is largely the result of the careful tabulation of expenditures kept by the American red cross society's engineers in constructing the highways in Shantung, Chihli and Shensi. We assume that the full reports of this work can be seen at the Red Cross headquarters in the United States, where the manufacturer of road-making machinery and contractors desiring information about item costs will receive every courtesy. However, some interesting information was given out in a recent lecture delivered by Mr. Lawrence Impey before the students of Peking College. Mr. Impey was chief engineer of the Red Cross during the recent famine relief operations in China and in that capacity did splendid service. We are indebted to the *Peking Daily News* for the full report of this lecture. After sketching rapidly the preliminaries leading up to the actual commencement of road construction, Mr. Impey then concentrated on the engineering problems, pointing out that the work originally commenced in Shantung was begun in the winter months when work is not usually done, and therefore the difficulties there were much greater than in other sections.

Again, the large quantities of sand encountered made construction very difficult, as there was no rock available, unless a light railway should be laid, and rock quarried and brought in from Tsinan, while there was almost no clay to be found either to serve as a binder to the sand. Up in Shansi the construction was of a very different character, as the road passed through mountainous country, and a large amount of rock cutting and blasting was necessary, together with the construction of numerous culverts and bridges to allow of the free passage of the streams which rise so rapidly in the rainy season, as to render traffic extremely difficult, if not dangerous.

In principle it was arranged to construct a twenty-foot highway, with a crown six inches above the side of the road, and a slope to the bank of less than forty-five degrees, while the whole road was raised several feet above the surrounding country where possible, in order to avoid the danger of floods. A two-foot "berme" or footpath was constructed half-way down the bank on both sides, partly to avoid subsidence, partly to give greater safety to traffic, and in many cases trees were planted along this to establish it and to shade the road.

A fifty-foot right of way was found to be necessary to provide the material for the road construction, and the excavations on each side of the road served as drainage ditches. The earth was thrown into place by hand, Chinese and foreign shovels being used together with carrying baskets, and the soil was then rolled or tamped in six inch layers by wooden hand tamps or stone rollers such as the peasant uses in his grain yard.

It was found that this construction would carry a loaded Ford truck quite satisfactorily at a speed of some thirty miles per hour, and that the laborers could place and tamp about one *fong*, or one hundered cubic feet, English, of earth per day. The workmen were recruited from the afflicted villages after an examination by the Chinese and foreign committee, and were organized in gangs of thirty, each under a headman of their own choosing, and each gang bringing their own cook.

Camps were provided in the villages along the line of the proposed road by arrangement with the village headmen and the *hsien* magistrates, not more than three hundred men being in any one camp, in order to avoid disease and facilitate handling and feeding. Several gangs were grouped together under a Chinese foreman, and were allocated to a certain section of road, while every ten li or so was under the supervision of a foreigner. Chinese inns and old temples were used as camp headquarters for the foreign staff and the clerks, interpreters, head foreman of the section, etc., and here under the district storekeeper was held the grain for feeding the workmen.

The payment consisted of five catties of mixed grains for each *fong* of tamped earth, and to enable this to be made a record was kept of the daily amount of work done by each gang, which was balanced every two weeks. A daily ration of about two catties of grain per man was made, together withan issue of fuel and salt and vegetables, which every night the gang accounts were settled up, and the men allowed two days to take their surplus rations to their families. I think that it is advisable not to move workmen more than sixty *li* from their homes where it can be avoided, and to only recruit sufficient to carry out the work in that area in a given time, about three or four gangs to a *li* being sufficient as a rule.

To turn now to the figures of the last famine relief, the total funds expended were Mex. $2,428,000, subdivided as follows:

	Amount	Per cent.
Food and wages to workmen	$2,025,000	83
Medical and sanitary	25,000	1
Commissary, stores, salaries	92,500	4
Engineering and transportation . ..	181,000	8
General (Peking and field headquarter).	104,000	4
	$2,428,000	100

The cost of the various roads per mile is approximately as follows:

Shantung dirt road	per mile	$1,719
Hantan dirt road	,,	3,500
Shansi dirt road	,,	6,410
Honan rock road 85% macadam ..	,,	1,200
Tientsin dirt road	,,	
Peking dome macadam	,,	4,166
Tientsin dirt road	,,	
Paotingfu over old cart track	,,	600

Altogether 860 miles of road were built at an average cost of $2,823 per mile, employing over 50,000 workmen altogether, and feeding some 250,000 dependants, the whole of the operations, from the inception to the closing down of work, taking nine months. Comparing this with other figures, the most economical I can find are those of the Taokow-Chinghua Railway, which shows a cost of $1,383 per mile for earthwork alone, to which would have to be added such items as bridges, overhead, etc., while it should be recognized that that work took place some fifteen years ago, when the cost of labor and food for labor was less than half what it is at the present time.

With regard to road construction I would like to point out that the narrow tired cart is the most destructive instrument of transport I have seen, and it should be either kept to a track at the side of the main road or done away with by means of a subsidy if possible, and a broad tire substituted. The greater part of the time and labor employed is used on the cuttings, embankments, etc., and only a small amount of skilled labor on the bridges, culverts and permanent way, so that I think in the future it will be found quite practicable to employ famine work on this very important branch of communications.

There are two principal difficulties which present themselves to the worker on these lines which I would like to refer to in closing. Firstly, the decentralization of government has rendered it difficult to inaugurate and carry out any united policy, while the people in general seem apathetic to the action of the authorities, unless it affects them directly. Secondly, the idea of public service seems to be in abeyance, possibly owing to the continued dominance of military and official rule, and until that is aroused very little can be accomplished.

The Far Eastern Review

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ENGINEERING FINANCE COMMERCE

5 JINKEE ROAD, SHANGHAI CHINA

Telegraphic Address: Farview, Shanghai

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The Future of Transportation in China

(A Word to the Consortium)

THE prolonged consortium deadlock and consequent delay in railway construction in China has undoubtedly created the opening for the extension of motor highways and the sale of cars and trucks, opening markets for one group of maufacturers, while others, dependent to a greater degree upon foreign financing, are compelled to sit tight until some way is found to overcome the obstacles to re-opening negotiations for railway loans. There is every evidence that the higher Chinese authorities are awakening to the fact that new highways and motor transportation under their own control are a greater and more immediate source of profit and revenue than foreign loan-built railways with their supervision over expenditures and operation. A highway scheme that promises anywhere from twenty to fifty per cent. profit the first year, holds out a much greater inducement than a mere eight per cent. railway loan from which adequate returns may not be forthcoming for many years. The prospects of high profits held out by these new companies comes nearer the Chinese idea of business and the old pawnbroking system of banking, than anything yet placed before them.

It is significant of the trend of the times, that one of the first acts of the new Liang Shih-yi administration was to issue a mandate exhorting the people of all the provinces to unite with the officials in opening up new roads, emphasizing their urgent necessity to promote commerce, industry and prosperity. The new Peking cabinet has been selected from the most coldly practical clique that modern China has produced, business men, promotors, financiers all, who think in terms of millions, and have had a finger in nearly every scheme of importance negotiated these past twenty years. A shrewder group of financial politicians cannot be found in any other country of the world. They have Tammany backed off the boards ; Mark Hanna and other politicians of a past generation who carried the American senate in their vest pockets, could sit at their feet and imbibe wisdom in the ways of running a government for the benefit of Big Business.

The new cabinet, is, in effect, a railway, or perhaps better expressed, a transportation group, whose power and wealth is derived from successful manipulation of the existing state railway revenues over a period of ten years or more. These keen practical minds with an inside knowledge of construction costs, volume of traffic and surveys of all parts of the country at their command, realize the possibilities of motor transportation, and apparently, have lost no time in encouraging the movement for the cheaper, and for them, the more profitable system.

It must be remembered that one of the most difficult problems facing the present Peking government in connection with formulating a national railway scheme that can be negotiated with the consortium, is the tendency of the provinces to revive the demand for autonomy in the construction of railways, a tendency strengthened by General Wu Pei-fu's policy of federalization. A federal government for China would deprive the central authorities of a monopoly over future railway financing, and make difficult the functioning of the present consortium or any other grouping of foreign capitalists. The new cabinet undoubtedly had this situation in mind in issuing the mandate encouraging the building of new roads as an outlet for provincial capital and so satisfy the craving for a share in transportation profits. Once the people and the provincial officials co-operate whole-heartedly in the construction of highways and operation of motor lines, there will be less and less clamor for recognition of their rights in financing the railways. With provincial capitalists confining their energies to road construction and motor transportation, the less profitable railways could with perfect safety be left to the foreigner to construct by means of loans. If Peking could bring about such an understanding it would materially clarify the atmosphere and perhaps facilitate the resumption of negotiations with the consortium.

In order to meet the new conception of government in the early days of the republic, Dr. Sun Yat-sen drew up a plan for financing China's railways based on the recognition of provincial autonomy, in which, because of the inadequacy of the central government's revenues to meet the interest, the loans would be secured by provincial bonds guaranteed as to interest and principal by Peking. Certain provinces are again raising the cry of "provincial rights" with General Wu Pei-fu, supported by many influential foreigners, advocating a federal state, which means in its last analysis, provincial autonomy and jurisdiction over the railways within their borders. With these unsettled questions delaying the unification of the country, by bringing the people into closer communication by means of railways, it is almost hopless to talk about national railway schemes or policies.

In our opinion, the difficulties attached to financing China's railways by means of loans secured by provincial bonds guaranteed by Peking, are insurmountable. It would seem, however, that the provinces might well be satisfied (at least during China's period of reconstruction) with a monopoly of highway building and motor transportation, which could be carried out by local capital, and leave the more expensive railways to be built through the issuance of foreign loans by the Peking or other recognized government.

If, as has been commonly accepted as the truth, the provinces have been actuated in their demands for recognition of provincial railway rights by a desire to participate in the financial benefits alleged to have been monopolized by Peking, a division of activities, whereby they would control the highway and motor transportation within their borders, should amply satisfy their craving and bring to them the most profitable end of the spoils. For, it is now being conclusively proven in all highly developed countries with proper highway systems, that motor transportation is fast crowding the railways, especially in the matter of short hauls, and diminishing their former earnings to a point where the future has become a matter of grave concern to their shareholders.

Motor transportation has not only passed the stage of being an auxiliary or feeder to the steam railways but has entered the stage of active and destructive competition. In the Far East, we have only to look at the situation in the Philippines, where, on the island of Luzon, motor transportation has so seriously undermined the earning capacity of the Manila Railway Company, that protective legislation has been demanded by the railway. This condition is due to the loss of their short haul traffic, taken over and monopolized by the numerous motor bus lines. And this condition will prevail in any Oriental country, where the question of time is of no particular consequence to the native. In other countries, the effect of good highways and up-to-date trucking methods has driven the short haul traffic entirely to the motor transport companies. The huge volume of cotton which formerly was carried by rail between Liverpool and the Manchester mill towns is now entirely transported by truck and the finished product is also handled in the same manner. In the United States, the silk motor truck caravans have taken over the transportation of this valuable commodity between the docks in Jersey city and the mill districts of Patterson.

In England, much of the coal is now transported on trucks. Roads in England and on the continent are good, the distances are short and heavy grades are few. The conditions arre ideal, and with the general use of trailers the costs are below those of the railways. As many as four trailers are now hauled by steam

trucks. The railways, while employing trucks for their own deliveries and collections, are being hard hit by a competition that has lost to them the short haul traffic. Another phase of European motor traffic consists in the heavy rails and road bed made necessary by the fast passenger trains, which has greatly increased construction and maintenance costs. These expensive road beds are not essential for the slower moving freight traffic, so the road bed, although the biggest investment, is the least used part of the railway, abnormally increasing freight rates.

All over Europe the motor truck is now not only an essential adjunct to the railway, but it has found a distinct place for itself, to the extent that new conclusions are being formed as to the place of the railway in the national economic system. It may turn out, if developments continue at the same pace as they have since the war, that the railway may ultimately be serviceable only as a special and not a general carrier, and so revolutionize the present ideas of transportation. This conclusion is also being forced home by the rapid development in Europe of air travel and transportation, displacing the railway for fast mail and passenger service.

What is taking place in Europe, to a certain extent in America, and under our noses in the Philippines, will follow in China as new roads are built. Local and short haul traffic between towns and cities will gravitate to the motor truck and omnibus, and the railways will get only the slow-moving, long-haul freight, and through passenger traffic. The cotton and the crops of Kiangsu will be hauled to market and the mill centres by motor trucks and the railway to Nanking and Hangchow will depend more and more upon through goods and passenger traffic. And so, in all other parts of China, the motor truck will open up and develop regions which the railway can never hope to penetrate.

With these conditions before us, militating as they do against any large profits from prospective railways, a situation is created that must be taken into consideration in any estimate of earnings of projected railways, a consideration that may well have an important bearing on loan terms and conditions. It seems fair to prophecy from present indications, that before any extensive railway scheme for China can be financed and the lines constructed, motor roads and transportation will have connected up many of the most important districts embraced within present railway projects. As these profitable highways and motor transportation services will be financed largely from private and provincial sources, it would seem that they might be content with this and concede a free hand to the central authorities to make such foreign loan terms for railway construction as new conditions may compel them to accept.

We can think of no combination that would be productive of more good to China than this, and if conditions so warranted, the establishment of a special sino-foreign bank operating outside the consortium agreement to finance these roads on approved provincial securities issued through and with the added guarantee of sound Chinese banking institutions, the work of the consortium in the development of new railways would be greatly facilitated. If foreigners are to live up to their oft expressed faith in the honor and integrity of the Chinese business man, as opposed to that of the official class, here it seems, is a good place to put into practice what they so loudly preach.

Heretofore, foreign financial assistance in the construction of China's railways has been extended for the purpose of creating markets for railway materials. The world has moved ahead, and the great automotive industries now clamor for similar assistance. In the case of the United States, the automobile industries last year paid in federal taxes alone, the sum of nearly $150,000,000. In return, the American manufacturer of motor vehicles is asking for the assistance of his government in developing foreign markets. The government has responded by creating an automotive division in the bureau of foreign and domestic commerce, and is sending a special expert to Asia to investigate conditions. Such an investigation will bring little practical benefits to the rapidly expanding automotive industries, unless countries like China can be made to purchase more and more of their products. Increased purchases can come only from the construction of new highways, and these must be financed. If the Chinese are unable to finance them alone, some practical plan should be evolved so that American investors can assist in this much needed development. There is no practical way to facilitate this except by relying on the good faith and accepting the securities of prominent Chinese or the sino-foreign banks who could take over provincial or municipal bonds, guaranteed, if necessary, in part, or in whole, by the central government. Such agreements could and would carry with them the provision that the automobiles or trucks employed by the road and transportation companies should be purchased from the country supplying the loan. As with America, so with other countries who manufacture motor vehicles for export.

In the past, too much stress has undoubtedly been laid on the future market for railway supplies in China and too little on the possibilities for the sale of motor vehicles and accessories. If the consortium cannot extend financial assistance to the development of a market for the important automotive industries of their various countries, then some other instrument should be created to take over this important task. G. B. R.

Shanghai-Nanking Profit Certificates

WHEN the £2,900,000 of Shanghai-Nanking 5 per cent. sterling bonds were issued in 1903 to build the railway of that name, subscribers for every £100 bond received one profit certificate which entitled the holder to claim a payment out of the net profits of the railway, the amount allocated to the certificate holders being one-fifth of the total net profits of the line. Naturally it took some time to build the line, and then it did not produce for years sufficient revenue to meet the full service on the bonds. The difference had to be provided by the Chinese government, and when the railway turned the corner and earned profits there were long-drawn-out negotiations to clear up the position as to how the deficiency arising from the working of the early years could be treated. It was finally decided that the deficiency had to be paid back before the profit certificates received a distribution, and in consequence of this it was not until the present year that a distribution could be made upon these profit certificates, the actual distribution being £1 per certificate, which required £29,000, as the number of certificates in existence is 29,000. The market for some time has taken an interest in the certificates, and occasionally there have been some quite numerous transactions, but there is a good deal of mystery as to the figures reported by the line from which the distribution was made. The distribution, we might state, was for the year 1920, and in that year we understand that the surplus profits amounted to $2,259,000, which had a sterling value of something like £326,000. One-fifth of this would amount to over £65,000, but the balance of the deficiency on the working of the line had still to be paid off, and other charges came upon the surplus profits, with the result that the amount divisible on the certificates was reduced to $1,120,000, which gave a sum of just over £29,000, and allowed of the distribution already mentioned. The position now is that the line has a clean slate in regard to the division of its surplus profits, and if net earnings are maintained it is evident that for 1921 the distribution upon the profit certificates should be much more than the one just made. Something over £2 seems quite feasible, and as the certificates stand in the market at about 12 ex div. they offer a rather tempting investment. The Chinese government have the right to purchase the certificates at £20 apiece, and as they had a life of fifty years they can run until 1953 if the purchase is not exercised. If the earnings of the line are going to remain at anything like the level of 1920 it would be a profitable operation for the Chinese government to purchase the certificates, but the holder would be indifferent to this matter, because the revenue is such that it would be preferable to allow them to run for over thirty years than to have them purchased at £20 apiece.—*Stock Exchange Gazette*, October 27th, 1921.

A NEW AVENUE OF SERVICE

AUTOMOTIVE SUPPLEMENT
OF
THE FAR EASTERN REVIEW

AN ASIATIC ORGAN FOR THE ADVANCEMENT
OF INTERNATIONAL AUTOMOTIVE INTERESTS

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IN order to keep pace with the rapidly expanding Automotive Markets in Eastern Asia, THE FAR EASTERN REVIEW will publish every other month a Special AUTOMOTIVE SUPPLEMENT devoted to New Road and Street Construction, Automobile, Motor Transportation, Motor Boat and Aviation Developments in this part of the world.

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Tangles of the Times

The Mistake that John Hay Made

WHEN Secretary John Hay in 1898-99 invited the powers to subscribe to the "open door" doctrine and the inviolability of the territory and sovereignty of China, certain very important and vital facts bearing on her status were concealed from him. The existence of the Li-Lobanoff secret treaty of alliance between China and Russia directed against Japan, and certain other important documents defining Russia's privileges and position in Manchuria were known only to an exclusive few in Peking and St. Petersburg. As long as American statesmen and editors refuse to view subsequent events in the light of the confessions of Count Witte, so long will they be unable to understand Japan's position. *The New York Herald* of November 9, in an editorial headed "The Distinction John Hay Made," disclosed a letter written in 1904 by the secretary of state to the editor of *The Sun* in which Hay explained the meaning of his note of instructions dated February 10th, 1904, to the American diplomatic representatives in St. Petersburg and Tokyo concerning the neutrality of China. This note read as follows :

"You will express to the minister of foreign affairs the earnest desire of the government of the United States that in the course of the military operations which have begun between Russia and Japan the neutrality of China and in all practicable ways her administrative entity shall be respected by both parties, and that the area of hostilities shall be localized and limited as much as possible, so that undue excitement and disturbance of the Chinese people may be prevented and the least possible loss to the commerce and peaceful intercourse of the world may be occasioned."

The *Herald* adds :

"The purpose and scope and limitations of this effort on the part of the sane statesman who gave to the country and the world the American doctrine of the "open door" were explained three days later in a private note for the information of the editor of *The Sun*. This letter, we believe, is now for the first time printed :

"I think you will see there is no dynamite in this and no 'promise or potency' of it.

"*We are not forming an alliance with any one* ; we are not binding ourselves to any action, immediate or prospective. We are simply trying to get both of the combatants to agree not to drag China into anarchy—a thing to be deprecated by all the world. Yours faithfully,

"JOHN HAY.
"DEPARTMENT OF STATE,
"WASHINGTON, February 13, 1904."

The object of the *Herald's* editorial is to emphasize that American policy at that time was identical with that which influenced our participation in the recent war against the central powers ; "association and co-operation without alliance." "Suppose," asks the *Herald* "he had proposed a cast iron treaty contract, to which the United States was a party, establishing a joint guaranty of China's neutrality and integrity during and after the war then beginning. That would have been an alliance and a committal on our part to military action, if necessary, to safeguard administrative entity. It would even have been an agreement to engage in war operations, if necessary, to compel China to remain neutral ; and what would have been our plight, after having guaranteed China's neutrality, if, through an upheaval of Chinese sentiment unfavorable to foreign participation in her affairs, she should have refused to remain neutral ?"

Well, we ask, what is our plight now ? Is Count Witte a reliable witness ? Did Sazanoff speak the truth about Russia's committments with China ? Up to date there has been no denial of the facts so revealed. Viewed in the light of these disclosures, does not John Hay's anxiety about the "open door" in China in 1898 and 1904 tell us that the United States was sitting in a game in which the cards had been stacked by the player we were protecting from being fleeced ? Here we were talking about the "open door" and insisting upon the maintenance of the neutrality of Russia's ally, who had secretly created the situation which made the war with Japan possible. The facts should teach Americans not to take too much for granted in dealing with China, for although we can depend upon the straightforwardness of the masses of the people, our altruistic policies designed for their protection are continually set aside and ignored by a group of self-seeking mandarins who have played the game with fifty packs of marked cards concealed up their sleeves.

We repeat, if American editors and statesmen are to continue to ignore historical facts and persist in approaching the Far Eastern problem from the sentimental standpoint of five years ago, before new light was shed on these matters, there can be little hope of ever understanding the viewpoint of Japan or arriving at a proper appreciation of China's troubles.

The Reason for John Hay's Mistake

John Hay's mistake was due to the same conditions that now confront the Pacific conference, the utter absence of any organized or stable authority in China ; the existence of a close clique or cliques of mandarins and military chieftains who recognize no responsible head ; a loosely-knitted aggregation of boodlers in which each high official takes upon himself the responsibility for compromising the nation in some special deal for his own profit with other powers. As Li Hung-chang cooly pocketed the bribe of Count Witte and secretly affixed his name on the dotted line to a treaty of alliance that he hoped would bring about the downfall of Japan, so, in countless similar instances, other officials have signed away the rights of their countrymen in order to increase their own well-being. Rarely, indeed, has it been possible during the past twenty years to deal with an organized government in China. Such financial deals as have been negotiated invariably have been the private perquisites of the officials concerned, without regard for the higher interests of the country or its people. China to-day faces the conference in the same position, so that many important American newspapers are asking the question, "What is China." The *New York World* answers the question thus :

"The China that exists, the China whose problems are vexing the conference, is hardly more than a geographical entity whose boundaries are not clearly established. There is no Chinese government that can speak for the Chinese people and act in their name. Nominally there are two governments, which are at war with each other—one in Peking and one in Canton. Whether either of them is a real government capable of performing any of the accepted functions of a government is a debatable question. The actual power in China seems to be in the hands of provincial governors whose allegiance is to themselves and who recognize a central authority only when such recognition happens to suit their purposes.

"It is all very well to talk about pledges to respect the integrity of China, but what is the China whose integrity is to be respected ? It is likewise well to talk about the 'open door,' but the 'open door' cannot be maintained by foreign influence alone. There must first be a Chinese government that can keep the door open, at least to the extent of not secretly yielding to foreign pressure and making itself the tool of foreign intrigue."

The Times (London) Peking correspondent gives a more accurate answer to the question in an article published in *The Times* of November 11. He says :

"In effect there are a dozen different governments in China, some entirely independent of each other, some recognizing others and having relations of a kind. Two are formal governments, the others are informal, but none the less organizations controlling large areas of territory without reference to any other authority."

The Times correspondent then goes on to describe the so-called central government at Peking, which operates with a president and a cabinet but without a parliament, whose constitutionality is admittedly irregular, but is upheld by the foreign powers who maintain the fiction that it rules the country. Then there is the Canton government boasting a president, a cabinet and a parliament, but with which the foreign powers will have nothing to do. Then there is Marshal Chang Tso-ling who dominates the Peking government from Mukden, the capital of Manchuria, a gentleman with a record, who has his own foreign office, his own armies and arsenals and rules as an autocrat pure and simple. In Yunnan and Szechuan are provincial governments owing allegiance to nobody. Central China is ruled by General Wu Pei-fu, who was looked upon as the "Hope of China," but who seems to have joined the jolly company of predatory tuchuns, acting independently of Peking and commandeering railway and other revenues of the central government because it failed to remit funds to pay for his campaigns. In various other provinces the military commanders are really independent autocrats, rendering lip-service to Peking but doing

as they choose. To illustrate the general situation it may be stated that during the past 15 months there have been four distinct wars in the country, each involving not less than 100,000 troops, in Chihli, in Kwangtung, and Kwangsi, in Hupeh and Hunan and western Hupeh.

Such is China. If it were not for the existence of the consortium and the iron-clad agreement between the international banking groups to refrain from lending funds to China until a stable government is organized and operating, it is safe to say that at the present writing there would not be enough of China's resources and administrative independence left to worry about. The "door" that Americans are so strenuously trying to maintain open would be slammed to, barred, bolted, locked, buttressed and riveted in their faces. Not one of these tuchuns but would hypothecate every available source of revenue and right to obtain the wherewithal to strengthen his position and extend his influence. We have only to read into the many such agreements that have been negotiated during the past few years, culminating in the contract between Dr. Sun Yat-sen and an American syndicate to understand just how much the Chinese mandarin cares about the American doctrine of the "open door" when they are out after the cash for political adventures. This, then, is the China that we must reckon with, as distinct from the China that is held up to our gaze by the western-educated delegates at Washington, and the masses of earnest returned students and merchants who are laboring to give effect to other ideals.

And with these conditions well in mind, the *New York World* concludes a most able editorial on the situation in the following words:—

"The first obstacle that lies in the way of a settlement is the failure of the Chinese people to establish a responsible government that can protect Chinese rights and at the same time carry out Chinese obligations. It is plain enough that before there can be a permanent agreement about any vital question pertaining to the Far East a way must be found to help the Chinese people put themselves on their feet politically. This is no easy task. It cannot be done unless the Western nations are willing to assume responsibilities and also give concrete proof of their good faith.

"They cannot very well insist that Japan must make all the sacrifices. We know very well what our attitude would be if 400,000,000 Chinese without a real government were only a few miles from the borders of the United States and we were dependent on that China for part of our food supply and the raw materials necessary to the very existence of our industries. If we stop for a minute and think of all the fuss we have made about the failure of Mexico to maintain a responsible government we can get a better notion of the attitude of Japan toward a population at least six times greater than her own.

"The test of any Far Eastern agreement at Washington will be the treatment accorded to China, but China cannot be saved merely by stabilizing the loot or arriving at an understanding as to the exact amount of foreign aggression that will be regarded as not detrimental to the interests of the other nations concerned. There must be a geographical China whose integrity is guaranteed, and means must be found to aid the Chinese people in establishing a political China that can perform the functions of government. How far are the nations represented at Washington prepared to go along those practical lines?"

China's Claims at the Conference

IN this hopeless state of disorganization, China presented her claims to the Conference in clear and forcible language.

She asked that all agreements that hamper her freedom and encroach on her sovereignty be abrogated. She wants her territorial integrity respected, foreign customs control and post office control abolished, Shantung freed, Japanese rights in Manchuria defined and limited, extraterritoriality enjoyed by other nations abandoned, foreign troops removed, her neutrality in future wars guaranteed and her national resources left in her own control. In a few words, she wants to run her own affairs, and she wants the system of exploitation and conquest to cease.

These were most ably presented by Minister Sze as head of the Chinese delegation, and embraced in the ten following principles:—

1. (*a*)—The powers engage to respect and observe the territorial integrity and political and administrative independence of the Chinese republic. (*b*) China upon her part is prepared to give an undertaking not to alienate or lease any portion of her territory or littoral to any power.

2. China, being in full accord with the principle of the so-called "open door," or equal opportunity for the commerce and industry of all nations having treaty relations with China, is prepared to accept and apply it in all parts of the Chinese republic without exception.

3. With a view to strengthening mutual confidence and maintaining peace in the Pacific and the Far East the powers agree not to conclude between themselves any treaty or agreement directly affecting China or the general peace in these regions without previously notifying China and giving to her an opportunity to participate.

4. All special rights, privileges, immunities or commitments, whatever their character or contractual basis, claimed by any of the powers in or relating to China, are to be declared, and all such or future claims not so made known are to be deemed null and void. The rights, privileges, immunities and commitments, now known or to be declared are to be examined with a view to determining their scope and validity and, if valid, to harmonizing them with one another and with the principles declared by this conference.

5. Immediately, or as soon as circumstances will permit, existing limitations upon China's political, jurisdictional and administrative freedom of action are to be removed.

6. Reasonable, definite terms of duration are to be attached to China's present commitments which are without time limits.

7. In the interpretation of instruments granting special rights or privileges the well established principle of construction that such grants shall be strictly construed in favor of the grantors is to be observed.

8. China's rights as a neutral are to be fully respected in future wars to which she is not a party.

9. Provision is to be made for the peaceful settlement of international disputes in the Pacific and the Far East.

10. Provision is to be made for future conferences to be held from time to time for the discussion of international questions relative to the Pacific and the Far East, as a basis for the determination of common policies of the signatory powers in relation thereto.

Although denied by the Chinese delegation, the correspondents of various important newspapers in America and Europe assert that the ten principles were drafted by Ex-Secretary of State Robert Lansing and Ex-Minister Paul S. Reinsch, working jointly as high advisers to the Chinese delegation. These ten points, according to these advisers, were intended to be applied as follows:

1. This proposal is intended to be a reaffirmation of the extent of the territory of China as it existed when formal recognition was made of the Chinese republic in 1913 and an effort to cancel all private agreements wholly Japanese in regard to certain portions of China. Agreement on this principle would prevent China being defined as within the great wall and would give her Manchuria and Mongolia as part of her geographical limits. Sub-section (*b*) is a rider to the first statement and is a pledge on the part of China that she will not alienate territory or lease any littoral and, further, that she will expect every power to support her in this position.

2. China seeks under this head to have the same principles applied in all parts of China, with Manchuria and Mongolia considered as integral parts of China, and wishes to give precisely the same status to all powers in her domain and to abolish the idea of spheres of influence and interest.

3. This principle is intended as a direct assault upon the Anglo-Japanese alliance, the Lansing-Ishii agreement and the so-called secret treaties of 1917 made between the powers without the knowledge of the United States upon the subject of Shantung. This is regarded as the keystone of all the proposals.

4. This principle is intended simply as a call or demand that every agreement or understanding of whatever nature touching upon anything Chinese made between powers shall be declared at Washington, and that here shall be inaugurated open diplomacy regarding the Far East and that hereafter everything shall be known as to the relations and treaties enjoyed by different countries. As an illustration of this, it is suspected by the Chinese that there is a secret agreement between Japan and France regarding the Eastern Railroad in Northern Manchuria.

5. This principle is intended to bring about the revision of all treaties dealing with extraterritorial jurisdiction, and finally to remove the conception that China is a mere treaty territory.

6. This principle seeks to establish another of the things greatly desired by China—tariff autonomy and the right to levy tariff duties on imports the same as any other country. At present China can only impose a tariff of 5 per cent. *ad valorem* on incoming products under treaty agreements, which have been in existence eighty years and have not been disturbed, despite changed conditions and the need for greater revenue. The fact that China cannot increase her tariff duties, the Chinese delegates assert, has prevented her going ahead in many ways, even though it gives equal opportunity to all countries.

7. As to the principle laid down in this proposal, the contention is set up that China should have the same powers in regard to her railroads, mines and concessions generally as obtain in all Western countries, and when circumstances arise the universal world practice shall be followed in favor of grantors. In effect this principle is intended to eventually give China the control and ownership of her railroads.

8. This is intended to serve notice on the world that China shall expect the powers to preserve her neutrality in a war in which she is not a part. This principle is inspired by the action of Japan in not observing the war zone laid down by her when Japan landed forces in Shantung and prosecuted military operations against Kiaochow in 1915 when Japan declared war against Germany. Instead of operating in the war zone the Japanese sent military forces first to Weihsien, which was outside the war zone, and to Tsinanfu, the capital of Shantung, thus occupying the whole line of railway to the capital. Tsinanfu is 256 miles from Kiaochow.

9. Proposes an arbitration commission to deal with the Far East similar to an agreement made between the United States and Great Britain in September, 1914, for the creation of a peace commission.

10. This principle is self-explanatory and calls for conferences from time to time to discuss international questions relating to the Far East.

From one point of view these principles constituted a challenge of the part of China to the good faith of the powers and means, and as the *Brooklyn Eagle* points out, "France and England as well as Japan must surrender certain privileges they enjoy and have long enjoyed, that the fruits of iniquitous wars in the past, as well as of iniquitous bargains must be surrendered to their real owners. The demands made by China will be hard to reject, the arguments she advances difficult to answer. The sympathy of the United States will be with the Chinese." From another viewpoint these ten principles so equitable and just on their face will not stand close scrutiny in the light of actual facts. The explanation given to Clause 1 by the high adviser to the Chinese delegation loses strength when it is recalled that at the time the Chinese republic was recognized in 1913, Mongolia had been a free state for over a year and a half, and ignores completely the part played by Japan in restoring Manchuria to China after the latter had practically surrendered all authority to the extent that Russia intended to turn it into a closed state like Bokhara or Turkestan. It loses sight of the further important fact that the independence of Mongolia proclaimed in 1911 was to have been employed by Russia as the means of extending her strategical railways for the further conquest of China and renew the conflict with Japan. The less China and her advisers have to say about Manchuria and Mongolia being at all times an integral part of the Chinese nation, the better, for the statement stands, defying refutation, that her sovereignty over these territories, such as it is, has been upheld and saved to her by Japan after she had surrendered them over to Russia in order that the latter might more readily crush Japan.

Naturally, with such palpable contradictions brought before the conference, the questions which obsessed the delegates more than anything else were: "What is the 'open door?' " "What is China?" "What is it that China wants?" "Who is menacing her integrity?" To reiterate the hackneyed accusation that Japan is the one predatory power encroaching on China's integrity, after she has saved and returned these territories to her and stands compromised to the maintenance of her sovereignty and the operation of the "open door" doctrine in these identical regions, seems like repeating the error of Versailles in trying to convert the conference into a court for the trial of Japan.

Japan's Cards on the Table

THERE would be little use in analyzing all the ramifications of the ten principles advanced by China as a solution to her problems, as the big issue as far as the conference is concerned, centres in Japan's claims in Manchuria and Mongolia, and here we must give close attention to the policy of Japan as outlined by Baron Shidehara to the correspondent of the *New York Times*. The main features of the Japanese position relative to the problems before the conference are set forth as follows:

1. The free and peaceful development of the commerce of Japan, the United States and other nations in the Pacific.

2. Support by all pacific means of the independence and integrity of China and the privilege of equal opportunity and the open door for the commerce and industry of all nations in that country.

3. Withdrawal of Japan's forces from the leased territory at Kiaochow, in the province of Shantung, on a basis which Japan hopes will be satisfactory to Great Britain and the United States and fair and acceptable to the Chinese.

4. Neither the annexation of nor a protectorate over Manchuria, but recognition of the principle that Japan has special interests there, based on considerations of propinquity, vast railway and other investments, and the considerable Japanese population that has penetrated into the region along the railway from Dairen to Changchun, these special interests being regarded by Japan as heightened by the fact that Manchuria stands in the path of possible future Russian aggression against Japan.

5. The open door and equality for other nations in both Manchuria and Siberia.

6. Neither annexation nor protectoral control of Siberia, but recognition of the principle of peaceful penetration of Japanese into that region for purposes of trade and commerce, to obtain raw material, and sell Japanese surplus manufactured products.

7. Withdrawal of Japanese forces from Siberia as soon as there is organized in the Russian Far Eastern maritime province and Siberia a government qualified and able to stabilize conditions, and in particular to afford protection to Japanese settlers, fishermen and other subjects of Japan resident there.

8. The hope and expectation of the Japanese that when Japan withdraws from the leased territory of Kiaochow and Tsingtao, the British will also withdraw from the leased territory of Wei-hai-wei, which is likewise in the Chinese province of Shantung.

9. The acceptance by China of the new international four-power consortium, in which the present participants are American, British, French and Japanese banking groups, with the object of negotiating and carrying out Chinese foreign loan business and assisting China in the establishment of her great public utilities with the co-operation of Chinese capital, but with consortium control and supervision to insure correct expenditure of foreign loans and to eliminate the possibility of the money being wasted or misapplied through corruption.

10. The stabilization generally of financial, economic and political conditions in China with a view to closer commercial relations between China and the outside world, China being regarded by Japan as one of the main sources of raw material sorely needed by the Japanese and as a market in which to dispose of Japanese manufactured products, without exclusion of or discrimination against other nations desirous of developing business and commercial relations with the Chinese.

11. The maintenance of the *status quo* in the Dairen leased territory and of the Japanese leased zone along the South Manchurian Railway.

12. Less concern over the renewal of the Anglo-Japanese alliance, which is not regarded as being so vitally necessary in view of the pronounced tendency of the Washington conference toward an agreement for sweeping reduction of naval armaments of the three leading naval powers.

13. Solution of the Yap question and the problem of trans-Pacific communications on a basis satisfactory to the United States and Japan and with the endorsement of the other governments interested in Pacific communications.

Thus did Japan reiterate and emphasize her oft repeated declarations defining exactly what she wants in Manchuria and Mongolia, a policy forced upon her by the attitude of other nations whose doors are closed to her people, compelling them to remain at home and seek their future on the Asiatic mainland. In other words, Japan says to the world, "we want a chance to live peaceably and exist honorably by a recognition of our special strategical and economic necessities in regions which we have saved to China at the expenditure of rivers of blood and treasure. We do not ask that China surrender one iota of her sovereignty, other than that which she willingly parted with in the South Manchuria Railway lease to Russia. This we must retain because of the fact that Manchuria stands in the path of possible future Russian aggression against Japan, and China is too disorganized and weak to guaranty her neutrality."

Naturally, Japanophobe Chinese and their American advisers, whose one-sided diplomacy created many of the issues the conference is now called upon to disentangle, see even in this explicit declaration of Japan, a hidden threat against China's future integrity and are moving heaven and earth through propaganda to create the impression that Japan is seeking to amputate these regions from the rest of China proper. It is inconceivable that Japan would go before the conference seeking to infringe either the sovereign rights of Russia or China, and the imputations of bad faith hurled against the Japanese are most untimely, certainly injurious and unjust.

Dr. W. W. Yen, China's foreign minister, hastened to declare the attitude of his government in an article published in a local weekly, and his views were accepted as meaning that China, as a last resort, will accept partial financial control, preferably by a Chinese foreign budget commission, but that she will never consent to Manchuria's alienation from the remainder of China.

Mischief Makers Busy

The mischief-makers lost no time in getting on the job, and we find ex-Minister Reinsch rushing to the front (page of the newspapers) to again warn the American people that war is inevitable. At the annual dinner of the Society of Colonial Wars, held in New York, referring to Japan's "obnoxious activities" in China, Dr. Reinsch indicated that America should prepare for war in the event the Far Eastern problems were not disposed of at the conference, adding that the Chinese rely chiefly on America to see that they get a square deal. Dr. Reinsch probably overlooked taking the audience into his confidence that he was one of the high advisers to the Chinese delegation and that her case, according to well-informed correspondents, had been drawn by jointly by him and

Mr. Lansing. In other words, unless the United States adheres to the policy laid down by Dr. Reinsch and ex-Secretary Lansing who created many of the issues through their man-handling of American diplomacy during the war, we must fight Japan. A little congressional investigation into the diplomacy of Minister Reinsch during his incumbency of office at Peking might reveal to the American people very good reasons why he should explain the raising of issues at a time when the nation was in no position to support him.

It is easier now to understand the inside working of the clique who hoped to manœuvre the United States into a position where war with Japan would become inescapable, in order to give effect to their conception of American policy in China. We can go back to the days of the Paris conference, where the chief American expert, on hearing of the Shantung award, is alleged to have declared, "THIS MEANS WAR." Mr. Millard, who disclosed this undiplomatic break, was accompanied to Washington by Mr. Eugene Chen and other young Chinese, who lent their energies to supporting Mr. Millard in his declarations. We mention Mr. Chen at this time, because he has recently produced further evidence that the Chinese and their Japanophobe friends seriously consider these matters as a war issue between Japan and America, mind you, not between China and Japan, but Japan and America, and, if by any chance, Americans fail to recognize this and permit Japan to have her way, then, in due time, China and Japan will fight us.

The Pan-Asiatic Bogey

MR. Chen, as the representative of the southern government at Canton, has contributed some highly interesting and enlightening articles to the local press about the issues at stake between North and South China, and although we heartily sympathise with many of the principles so ably expounded and would wish with all our heart to see his ideas realized, yet we must take issue with that part of his arguments which advocates American naval power as a factor for China's security. In elucidating the Pacific question, Mr. Chen breaks his argument into a series of numbered statements, viz. :

(1). Japan frankly claims that her territorial expansion is a national necessity in order to secure room for her surplus population.

(2). It is admitted that such room is available in Australia and in America. But certain considerations of high policy forbid the entry of Japanese immigrants into those lands.

(3). Hence, the thesis which insists that the existing *status quo* in the Pacific shall be fundamentally altered in favor of Japanese emigrants.

(4). It is believed that such a solution of the Pacific question could only be effected by a Japanese victory in a war with America.

(5). It is plain, however, that Japan could not vanquish America if she had to rely on her own resources. But it is equally plain that she could do so if Chinese man-power and Chinese natural resources were at her command. China exceeds Europe in area, population and, probably, natural resources. Hence, the *raison d'etre* of Japan's policy in China.

(6). It is also a term of the argument that Japan's real aim is masked in the contention that she seeks in China only room for her surplus population and the raw materials without which her industries would perish. But intra-mural China is over-crowded, and the conditions of life in extra-mural China—Manchuria and Mongolia—are not suitable for genuine Japanese, as distinguished from purely political, colonisation in those regions. As regards raw materials, these are and will always be available to Japan through the ordinary channels of international trade and commerce.

(7). These considerations, therefore, seem to support the view that Japan's policy in China aims at the domination of China with her man-power and natural resources in order to enable Japan to force open the gates of Australia and America to Japanese immigration.

Here we have in plain words from one of the foremost Chinese writers of the day, a clean confession of China's weakness, an admission that his countrymen, once disillusioned of the idea that the United States will act as their guardian, will ally themselves with the Japanese for forcing open the doors of America and Australia to Chinese and Japanese emigration. This argument tells us in no uncertain language that the Japanese are not wanted in China under any consideration, and we come back to the question of where are they to go, how are they to live ? If all the other countries bordering the Pacific close their doors to the Japanese and Chinese, and China insists that her neighbors cannot enter her domains, and the Japanese keep on increasing, then we arrive at precisely the situation we have tried to impress upon Americans. If the Japanese are barred from freely entering Asia through the hostility of China in territories that Japan has saved for her, and she is strong enough to make it stick, then some day the racial issue will be forced over the Pacific for the boys of America and Canada to settle, and that day will find China solidly lined up on the side of Japan. In other words, the policies of Russia and China would force the racial issue which belongs in Asia over to the shores of America, and if Americans insist upon having the question settled where it rightfully belongs, then China will permit herself to be led by Japan and retaliate by forcibly opening our doors to the hordes of Asia. According to these thinkers there is no escape for America. Willy-nilly we must fight Japan or a Japanized China will some day get us if we don't look out.

China's Threat to America

Chinese writers who flaunt the Pan-Asian bogey to scare Americans only make the case worse for themselves, for if present-day talk carries any weight, the first thing a militarized China would do would be to throw out their Japanese overlords and square accounts with Russia, and here they would have all they could attend for a generation or so without planning to force open doors thousands of miles away over an ocean guarded by the fleets of the white races. As long as America, Great Britain and France retain supremacy of the seas, we will lose no sleep over the arguments advanced by Mr. Eugene Chen to frighten Americans into becoming China's permanent guardian. Dr. Wellington Koo and others tell us in one breath that the future peace of the world depends upon a strong China, whose people with their pacific tendencies can be depended upon to do away with militarism and wars of aggressin, and in another breath we are told by equally prominent Chinese, that if America don't protect them against Japan, then, we must accept the consequences.

Mr. Chen, as spokesman for the Chinese who insist that America must fight Japan (an opinion also shared by his colleague, Dr. Ma Soo, the Canton delegate at Washington) insists that a mere limitation of armaments, especially American naval power, cannot solve either the Chinese or the Pacific problems, for then Japan's ability as the greatest military power in Asia to prosecute her policy of ascendency in China would be increased, not diminished.

"On this view" says Mr. Chen, "America would be faced with the political paradox of working the gravest injury to China whilst genuinely trying to assist her. But it would not be the first time. That paradox was seen in the Knox scheme of railway neutralisation in Manchuria ; and it was repeated in the policy which brought China into the great war and sacrificed her at Versailles. And the same paradox will reappear so lung as it is not realized that the future of China is a vital—not an altruistic—concern to America.

"If the future of China is rightly envisaged as a vital American interest, you will see the cogency of the related view that a limitation of American armament must be supplemented by the strengthening of some internal stabilising force in China unless the intervention of America is to worsen the present grave state of the country.

"In terms of practical politics, such a stabilising force must take the form of a national government."

Quite right. But who is to undertake the task of stabilization ? What shape should this intervention take ? The future of China is primarily a vital Chinese interest, and if this is to come from some stabilizing force from the outside, which faction in China is to be supported ? Can foreign nations be expected to do something for the Chinese they are incapable of doing for themselves, and if so, can any one foreign nation, especially America, take on its shoulders such a herculean task ? Mr. Chen is advancing a strong argument for intervention, a plea to give practical effect to that phase of the Hay doctrine so forcibly outlined by Minister Schurman in his Peking speech. Here we have the spokesman for one element of Chinese political life advocating a policy strenuously opposed by other equally important elements. If such a proposal was seriously advanced by a foreigner, the Chinese would come together as a unit to repudiate it, as happened at the very outset of the conference, when it seemed that such a solution

might be urged on the delegates. If China is to be preserved as a national entity and a stable national government created in order to offset the decrease in naval armaments and provide a military check upon Japan, then the job is one that the United States could not undertake without inviting the very thing that the conference was called to avoid. In other words, the argument remains that the only salvation for China consists in the United States going to war with Japan. It is a remarkable fact that all the Canton publicists are a unit on this point. It would seem more practical, that the stabilizing of China should be a task for all the interested consortium powers, who would have to undertake definite responsibilities and obligations, financial in the beginning and not impossibly political in the end. The United States would never undertake this job alone.

"Sold to Japan"

THE mere fact that an American differs from these radical Chinese views or challenges the American Japanophobes who carry out their propaganda, brings upon him the charge of having "sold out to Japan." The Chinese have become so accustomed to being told that America will fight their battles for them, that any deviation from this solution to the question is denounced as anti-Chinese and unpatriotically American, and efforts have been made to discredit whoever dared to run counter to the ideas of the inner ring dictating American policy in these matters. This phase of the intrigue to railroad the United States into a war with Japan would make extremely interesting reading for the people of the United States, could all the facts be correlated and placed before them. The audacity of these mischief-makers was again witnessed when the report was circulated early in the conference that the "United States had sold out to Japan," simply because the level-headed people of America were asking embarassing questions about the inner facts of the controversy between China and Japan and seemed for once to extend a little sympathy to the latter country in her dilemma. Needless to add, that the Washington authorities immediately served notice on certain Chinese at the conference that such tactics on the part of their numerous publicists was resented as an insult. We have heard no more about America selling out to Japan. This is simply another angle of the campaign designed to compel the United States to fight Japan, made possible by such diplomats, who like Dr. Reinsch and others in the service of Peking or Canton insist that war is inevitable unless the nation supports them in solving difficulties they were largely responsible for creating. No wonder, that when such high representatives of a former administration talk in this strain and permit themselves to be quoted, and predict on the speaker's platform that war will happen within ten years, and American publicists in the service of China boast that they will bring this war about, that the Chinese and the ordinary American man-in-the--street began to believe that this was the only solution.

"Discrediting" Lamont

IT is a matter of congratulation, however not only for China but the rest of the world, that the Pacific atmosphere is being cleared, and as the mists of misunderstanding are blown away by the clean air of truth, Japan is revealed to Americans in a light which compels sympathy and respect. The personalities of the mischief-makers are being disclosed. The trick of abusing and impugning the integrity of everybody who disagrees with them is reacting like a boomerang upon China's foremost advocates. The attempt on the part of Mr. Lennox Simpson to place in question the integrity of J. P. Morgan & Company in the matter of the German Hukwang bonds has left a bad taste in the mouth of Americans, and there is talk of a congressional investigation. It is a pity that such an investigation into the conduct of our affairs in China could not have been ordered two years ago. The present conference might not have been necessary. That, however, is another story. Mr. Simpson, as one of the advisers to the Chinese government, alleged that J. P. Morgan & Co. sought to make the payment of interest on the German Hukwang bonds contingent upon the negotiation of a new loan of $16,000,000 to redeem the principal and interest on the loan due the Continental and Commercial Trust Company of Chicago, which matured on December 1st and was defaulted by the Chinese government. The Chinese delegates at the conference confirmed the statements made by Mr. Simpson and supplied further details of the way the German issue of Hukwang bonds came into the hands of American bankers. It was stated that all the bonds the American group and Mr. Lamont are alleged to have demanded payment upon were traced directly to German sources by the Chinese government, and shown, according to them, to have come into the possession of J. P. Morgan & Co. after China declared war against Germany and repudiated payment on the issue.

It was asserted that $250,000 of the bonds, said to have come into the hands of J. P. Morgan & Co., came directly from the Duchess of Luxemburg and that the rest of the $3,000,000 came to America from Scandinavian banks. These banks were said to have obtained the bonds from Germany in payment for war materials furnished that country.

Such a story emanating from official Chinese sources struck not only at the integrity of the American group, but at the consortium as a whole, and brought forth an immediate and vigorous denial from Mr. Thomas W. Lamont, the chairman of the consortium and head of the American group. Mr. Lamont's answer is given herewith in full:

"The intimation that the American group made it difficult for China to obtain a loan in the American market is unqualifiedly false. On the contrary, the American group, though not directly concerned or interested in the loan that fell due on November 1, made the most strenuous endeavors to assist China to meet its maturity.

"There was no particular reason why the American group should undertake to lend money to China in order to take up its outstanding loan, for the consortium was originally established not for the purpose of looking after China's current obligations, but rather in order to furnish to her from time to time as she might require them fresh funds for actual constructive purposes, such as currency reform, the building of railways, etc. Because, however, word was received from Peking to the effect that the government might have difficulty in meeting its nearby maturities, the American group endeavored to formulate a plan whereby such maturities would be cared for and sufficient funds advanced to China to enable her to remedy her failure months ago to pay the coupons upon certain of her outstanding Hukwang railway bonds.

"These bonds had been originally issued in Germany, but had apparently even before the great war fallen into the hands of innocent holders in other countries, and China's failure to meet the coupons as presented by those innocent holders had resulted in injuring her credit here; so the American group felt that any new issue would be more than doubtful of success unless funds were provided to enable China to cure her default. The intimation that these past due Hukwang coupons constituted a claim on the part of our firm is entirely without foundation, as neither we nor, so far as we are aware, other members of the American group are holders of these bonds."

Mr. Simpson, in his zeal to aid China made the same impression in the United States that he did in England, where, according to press reports, the British government requested that his activities be curtailed. His attack upon J. P. Morgan & Company is declared by American bankers to be inspired by a desire to arouse China's opposition to the consortium and in doing so, he deliberately ruined China's credit in the American investment market at a time when she is in desperate need of money with which to rehabilitate herself. On the other hand, it is easy to see that this attack on the integrity of the most influential American banking house is in line with other attempts on the part of China's propagandists

to besmirch the character of and impugn the motives of any American who has a good word to say for Japan. In the eyes of China's advocates, Mr. Lamont has been the greatest obstacle to the success of their campaign, by his open advocacy of co-operation with Japan. "Pressure must be brought to bear on these highly placed Americans who adhere to this policy, in order to compel them to modify their views," we were informed in Peking. Perhaps Mr. Simpson sought to apply the pressure, and offset the strenuous efforts of Mr. Lamont, Judge Gary and others to clarify the atmosphere.

The Boomerang

IF so, the attempt failed for only a week after this episode, Mr. Lamont had occasion to once more challenge the veracity of the Chinese propagandists who insist that war is inevitable and that Japan is seeking to establish her supremacy in Asia irrespective of the rights of all other nations. This opportunity came at a huge banquet attended by over 800 people, given by the Japan Society in New York to the members of the Japanese business men's party then in that city. After emphasizing the point that business men and bankers do not profit from war and its preparation, he sent this solid shot into the cohorts of armageddon :

"There are on both sides of the Pacific mischief-makers, and it is our business to thwart such people and such newspapers as breed suspicion and envy and rancor and fear. We here of the Japan Society take it upon ourselves day by day and year by year to correct misstatements and misconception as to Japan.

"We deny that the Japanese people desire to conquer Asia. We deny that they will fight to dominate the Far East. We assert that they are a peace-loving people, of noble tradition, living in a bountiful land, themselves imbued with ideas of beauty and art and earnestly desirous of cultivating their civilization free from warfare and strife."

This gives the direct lie from the most prominent American banker and his business associates to the pernicious campaign that has been waged since the Versailles conference to manœuvre the United States into a position where war with Japan could not be escaped. It is the answer of sober-minded America to the paid clap trap of the clique that would plunge America into hostilities in order that it may maintain prestige and position with its Chinese paymasters. It carries the message to Japan that there exists in the United States a strong and influential element who will oppose to the utmost the damnable propaganda that war rather than co-operation is to be the climax to our misunderstandings. No honest man could impugn the good intentions and sincerity of the Japanese business men who responded to Mr. Lamont's declaration of good will.

Replying to the warm welcome extended to him and his associates Dr. Dan of the great Mitsui firm said :

"We are exceedingly anxious that your judgments should not be influenced or led astray by the propaganda of mischief-makers. The mutual prejudices created and held for centuries in the mind of peoples should now be dispersed and we all, Westerners and Easterners, should meet on the common ground with reciprocal confidence and hearty goodwill."

The differences between Japan and America are shallow, the voices which whisper of trouble are weak. Ex-Secretary of Commerce Redfield said in urging closer relationship between the countries. Baron Nakashima, Manzo Kushida and Umekichi Yoneyama and other speakers explained their mission to be one of furthering better understanding and closer relationship and then begged of the American business man to seek to comprehend their good intentions.

Japan Asks for Justice

ASKED to cite the greatest difficulty to good understanding among the nations, Prince Tokugawa of the Japanese delegation to the Washington conference replied promptly and specifically :

"Ignorance. Lack of information. We should have more of you newspaper men traveling back and forth."

This is the kind of talk that is winning the American people over to a more sympathetic understanding of Japan's problems. Japan courts publicity. She laid her cards fairly on the table and presented her case briefly in the points laid down by Ambassador Shidehara. Japan does not want to annex Manchuria or Mongolia, she is willing to meet China fairly on the disposition of the Shantung railway. Her requests simmer down to a simple recognition of her sacrifices in preserving Manchuria to China at a time when China had surrendered her sovereignty to Russia. She does not ask for special privileges in those regions, but she does expect that these lands will be opened in some way to international development so that her people may find opportunities for their excess energies and assure to them the raw materials that will permit them to exist in their own country, and not force them to adopt race suicide when other peoples are permitted to increase, multiply and colonize vast waste spaces they have stolen from others. Mr. H. G. Wells, the eminent English writer, submits in one of his articles that "the troubles arising from excessive fecundity within a country justify not aggressive imperialism on the part of that country, but a sufficient amount of birth control within its proper boundaries." Fine ! for any people who have the unlimited right to chose their home in any country or clime under the sun ! Excellent ! for those who have appropriated unto themselves the great vacant spaces of the world and hold them closed to others, but to deny the right of Japan to find homes for her surplus millions in Eastern Asia in lands they have preserved to the Yellow Race, and then place obstacles in their way of obtaining the food and raw materials necessary for them to exist at home, is condemning a nation to death, an invitation for Japan to commit suicide.

Mr. Chen says "that as regards raw materials these are and will always be available to Japan through the ordinary channels of international trade and commerce." But when Mr. Chen and his friends determine that America will not fight their battles and the Chinese again find some excuse to boycott Japanese goods, what assurance has Japan that her vital economic interests will be respected in Manchuria and Mongolia. What guaranty can Japan be given that food supplies and raw materials from the nearby regions of Manchuria so necessary for her existence will not be stopped through some future student agitation in which those who now talk so glibly about the free channels of trade and commerce, would be the first to obstruct the unrestricted interchange of commodities ?

Is Japan Justified?

IS Japan justified in her stand regarding the vital economic importance of Manchuria to her national existence or is this simply a camaflouge argument advanced to conceal aggressive and imperialistic designs as alleged by Chinese writers ? Whenever Japan has a short rice crop and is compelled to import heavily from other rice-producing countries, who are the first to accuse her of taking the food out of their mouths by purchasing on the open market her necessities ? The Chinese. Who does not recall the recent hullabaloo indulged in by Chinese writers in America accusing Japan of buying up their stores of rice at exorbitant prices at a time whem millions of their own people were starving ? Who does not recall that every now and then the export of cereals is prohibited in China ? Where then, in the event of a great food shortage can Japan turn for her staple food ? Mr. K. K. Kawakami in

explaining this necessity of Japan, tells us in the December *Review of Reviews*, that

"Driven by necessity, the Japanese have been cultivating their lands so intensively that the law of diminishing return has long since begun to assert itself. Even the most painstaking application of fertilizing process cannot stay the operation of this natural law. To-day the soil of Japan is no longer capable of feeding its own population. Alarmed by this condition, the Japanese government a few years ago conducted an investigation into the possibility or impossibility of extending the area of farming land. The result of this investigation was disappointing. In a word, the country offers no new land that can be opened for farming purposes."

Mr. Kawakami might have added, that the decreasing productivity of the Japanese farm is maintained as it is by the excessive use of fertilizer imported fron Manchuria. The bulk of the great bean-cake exports of this territory go to Japan for use as fertilizer. Deprive the Japanese farmer of this cheap commodity, and he will be compelled to purchase the higher priced products with a corresponding increase in the cost of his staple crop. Aside altogether from all other Chinese products, any interference with the steady export of Manchurian bean cake to Japan, spells disaster to the Japanese farmer, an increase in the cost of living for the masses.

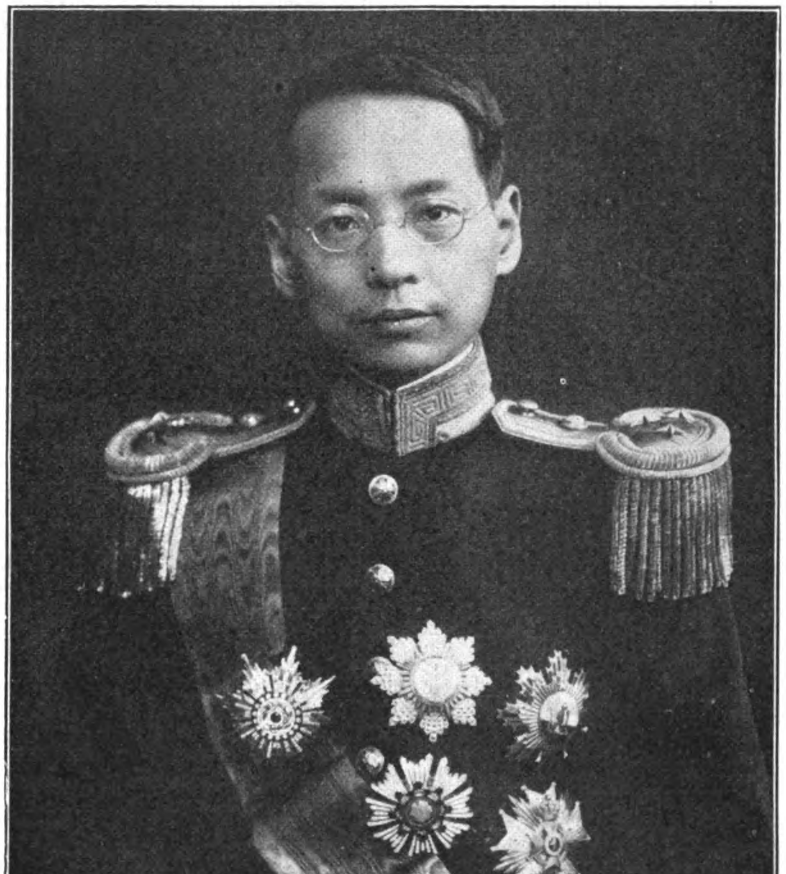
Is Mr. Kawakami correct ? Where then can Japan hope to obtain a cheap and readily accessible supply of food for her increasing millions ? From China with its frequent prohibition of rice exports ? Hardly a safe reliance for a nation of 70,000,000 people. What is the answer ? Manchuria is rich in wheat, which the Japanese are trying to induce their own people to eat as a substitute for, or a supplement to, rice. The movement is meeting with some success, but Japan has still to buy yearly large quantities of rice in foreign countries, particularly from French Indo-China.

The Japanese hope some day to make Harbin the Winnipeg of the Far East and to carry down to the sea, over the South Manchuria Railroad, the products of Manchuria and adjacent Siberia.

Japan hopes to teach her people to eat wheat and meat instead of fish and rice and these necessities can only come to her people at prices within their reach, from the nearby lands of Manchuria and Mongolia. If we try and visualize Japan's problems in the light of current Chinese antagonism, can we blame them for insisting on some solution that will keep open the door of these regions for the constant egress of food supplies and raw materials upon which the very life of Japan depends ?

H.E. Liang Shih-yi

China's New Premier

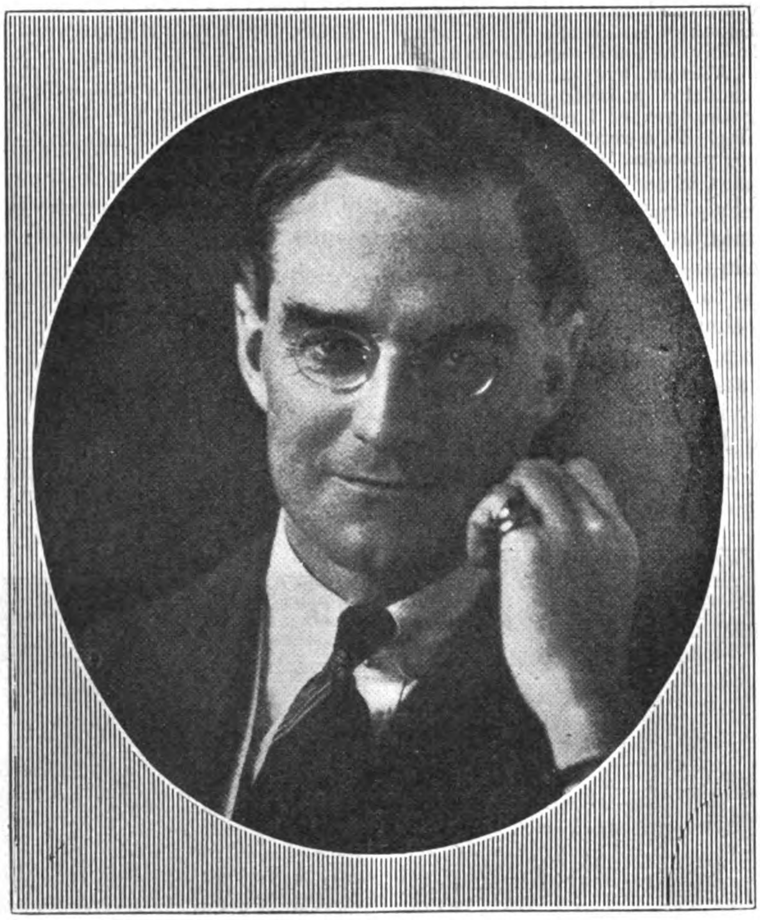


H.E. Yeh Kung-cho

China's Minister of Communications

CHINA'S NEW CABINET

The Chinese political wheel has turned once more bringing the old Chiaotung (Railway) group into power again, with Mr. Liang Shih-yi as Premier of a cabinet backed by Marshal Chang Tso-ling and acquiesced in by Marshal Tsao Kun. It is too early to venture an opinion as to the ability of the new cabinet to steer the government over the financial rocks of the Chinese New Year and pay salaries to officials and troops. When everything looks darkest in China's finances, somebody comes through with a few millions that enables the government to hang on and save its face until more juggling becomes necessary. Liang Shih-yi is China's most accomplished financial expert.



Mr. C. R. BURKILL,
Chairman of the Shanghai Automobile Show

The Shanghai Automobile Show

THE automobile dealers of Shanghai and the manufacturers so ably represented by them are to be congratulated on the success of their first effort to hold a show in the Far East, which proved to be equal to many held at home where every convenience is afforded to facilitate exhibits. The success of this first show has started others talking about a big industrial or engineering exhibit. This came as a natural sequence to the many exhibits of machinery and accessories that somewhat modified the character of the automobile show. As was to be expected, the show was international; all types and makes of cars and accessories being displayed. It is not our purpose to dilate on these features as they have all been fully covered by the local and other papers, contenting ourselves with a brief description of the various stands and exhibits.

No description of the show, however, would be complete without an acknowledgement of the valuable services of those who made it possible and lent their untiring energies to bring success. Those responsible for the exhibition are: Mr. C. R. Burkill, chairman; Mr. M. W. Buck, treasurer: Mr. Joseph J. Keegan, hon. secretary and Mr. Arthur West, manager.

The executive committee are: Messrs. F. P. Bills (Hudford Motors); M. W. Buck (China Mutual Trading Co., Ltd.); C. R. Burkill (A. R. Burkill & Sons); G. W. Chandler (Dunlop Rubber Co. (China), Ltd.); Leon Friedman (China Motors, Ltd.); P. W. Giovannini (H. S. Honigsberg & Co., Inc.); A. H. Hallam (Vacuum Oil Co.); H. O. Hashagen (Standard Oil Co. of N. Y.); F. Wells Henderson (Inniss and Riddle (China), Ltd.); H. S. Honigsberg (H. S. Honigsberg & Co., Inc.); Joseph J. Keegan (Motor Insurance Loss Assessor); S. C. Lee (Lee and Lee Garage, Ltd.); W. S. Leonard (U. S. Rubber Export Co., Ltd.); Ph. Osterberger (Grand Garage Francais); S. W. Pratt (Shanghai Horse Bazaar and Motor Co., Ltd.); R. R. Roxburgh (John I. Thornycroft & Co., Ltd.); R. T. Ryton (The Auto Palace Co.); E. J. Surman (Jardine, Matheson & Co., Ltd.); C. J. White (The Central Garage Co.); K. Y. Yao (Wah Chang Trading Corporation) and George Wilson (The Asiatic Petroleum Co. (N. China), Ltd.)

United States Rubber Company

STAND No. 1.

IT is superfluous to describe in detail the many varieties of tires manufactured and exhibited by this great American company, the largest of its kind in the world. It is, however, of interest to China automobile and truck owners to know that this company maintains its own special representative in Shanghai, working with the Shanghai Horse Bazaar & Motor Company, Ltd. in order to carry out the manufacturer's idea of service, especially in the matter of assisting truck users to select the proper tire for each particular use. The United States Rubber Company were quick to sense that truck users were coming to realize that tires have a very important part in successful truck operation, and that the tires are a separate problem from the truck itself. It has been hard to get sound advice regarding tires. It has not always been easy for a tire manufacturer to advise the use of some kind of equipment which he did not himself manufacture.

Take, for instance, the subject of pneumatic truck tires. The advice regarding the use of these tires has been both confusing and incorrect in nearly all cases. Many a truck owner has learned by expensive experience that the pneumatic has a clearly prescribed field, and that the use of pneumatics outside this field means the waste of money. As much money is wasted to-day they contend, on wrong tires as on poor ones. Some truck owners wonder why their tire bills are so high while others are moderate. The answer is to be found in many cases in the fact that the wrong type or the wrong size of tires has been selected.

The uses to which trucks are put are so varied and the types and sizes of tires so numerous that it is a very easy matter to select the wrong tire for some particular kind of haulage.

In the interest of greater economy, the United States Tire Company has established a technical service department, made up of tire engineers, which will give impartial, disinterested advice to everybody engaged in truck operation. A full statement of any tire problem from any truck operator in the world will bring a detailed reply from the department or its representatives giving the latest scientific information on the points involved. Making a complete line of tires, the company favors no type above another. As the largest rubber company in the world it has a large staff of chemical and engineering experts which is made available to the truck operator through the technical service department.

"We intend that the technical service department shall be used freely by every person who owns a truck," says C. K. Whidden, manager of truck tire sales of the United States Tire Company. "Whether an owner is a patron or not makes no difference, all our facilities for correct information are at his disposal.

"If some large user has a number of hard knots for solution, we will be glad to have an experienced engineer visit him for several days if necessary in order that his problems may be satisfactorily solved.

"Nearly half of the trucks of the country are operating on the wrong kind of tires. This is a condition we hope to correct."

Along these lines the representative of the United States Rubber Company in China and their other agents throughout the Far East, expect to be of service to truck users, irrespective of the make of truck they are using.

Shanghai Horse Bazaar & Motor Co., Ltd.

STAND Nos. 2, 3, 4

THIS company features the Rolls-Royce, Studebaker, Fiat and Maxwell cars. The Rolls-Royce limousine on exhibition is undoubtedly one of the finest cars on the floor. The chassis was shipped from the company's works in London, but the body was built and upholstered at the local works of the exhibitor. The sides are of aluminium with welded joints, and moulding of Chinese redwood. Silver-plated fittings, electric speaking apparatus and other high-grade accessories complete this luxurious car.

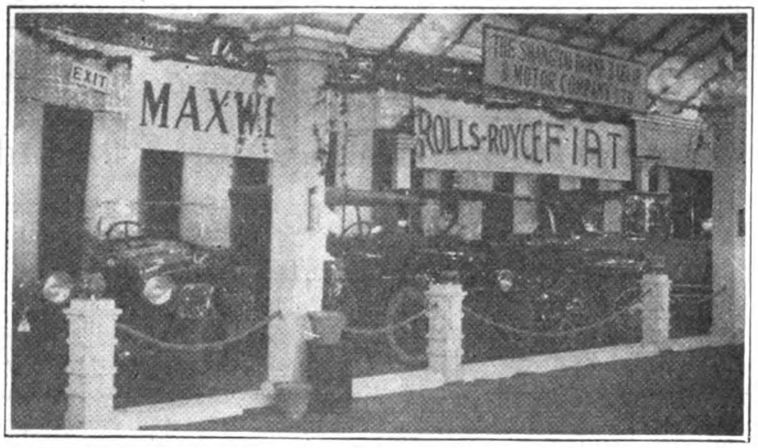
The engine of 40-50 horse-power is a six cylinder vertical type suspended on the frame by a patented device, which allows the members of the frame relative movement to one another for the negotiation of rough roads without involving extra strain on the arms of the crank chamber. The cylinders are cast complete in groups of three and the valves are arranged along one side of the engine and are operated by a single cam shaft. The inlet and exhaust valves, of high chromium steel, are interchangeable. The induction and exhaust valves are operated by means of rocking levers pivoted at one end, and fitted at the other with a roller lying between the valve spindle and the cam. These levers are fitted in pairs, one inlet and one exhaust, mounted on one base, and attached to the crank chamber by studs. The introduction of the roller and lever eliminates the side pressure exerted on the lifter slides when cam and tappet rod come into actual contact. The carburetter is of the float feed spray type, fitted with a special automobile valve, which accurately adjusts the carburation for all speeds of the engine, and enables the engine to run "dead-slow," with a maximum of torque when required,

THE FIAT TRACTOR.—Although not exhibited at the show, the new Fiat tractor is one of the most promising machines for the Far Eastern market, especially in regions, where like Manchuria, Siberia, Philippines, Siam, the F.M.S., Dutch East Indies and Formosa, agriculture is conducted on an extensive scale. These machines have just completed some severe tests in competition with makes of all other countries with great success.

One of these Fiat machines ploughed 0.69 acres an hour to a depth of 7 inches with the use of only 15.3 pints of paraffin per acre. On the drawbar tests the pull to skid the wheels was 3,500-lbs., and the sustained pull of the Fiat was 3,000-lbs. On the belt test the brake horse-power at a belt speed of 2,200 feet per minute was 26.2, and the maximum brake horse-power was 27.5.

One of the features of the trials was the use of French national fuel composed of 50 per cent. benzole and 50 per cent. alcohol, whose use is recommended by the government in order to encourage agriculture and to make the French industry independent of foreign fuels. Better results were obtained with this fuel than with paraffin, the machines hauling six furrow ploughs and working to a depth of nearly eight inches, notwithstanding the very hard ground which has not been cultivated for seven years. Owing to a temporary shortage of benzole the percentage of alcohol had to be increased on one or two days to as high as 90, but this did not affect the working of the engine, nor was any difficulty experienced in starting up from cold. The only mechanical change made in the engine was a slight increase in compression, and, of course, the carburetter was adjusted to get the best results with this fuel.

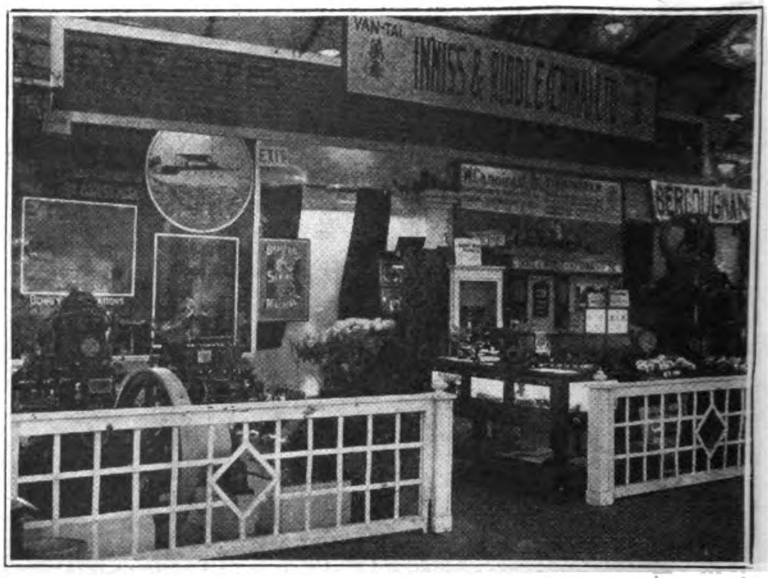
The lesson learned from the trials is that farming operations can be conducted very successfully with native-produced French fuel which under present conditions is cheaper than imported petrol.



In addition to the Rolls-Royce, the Shanghai Horse Bazaar and Motor Co. exhibit a complete line of the Studebaker Sixes, making an exceptionally fine show. The seven-passenger big six shown is a car of 126-inch wheelbase, with 60 horse-power Studebaker demountable-head motor with two-range carburetter, shock absorbers, artistic straight side slanting windshield with ventilator base and integral corner lights, jeweled eight-day clock, tonneau light with extension cord, gypsy head with rectangular plate-glass window in rear, 33 by $4\frac{1}{2}$-in. cord tires; weight 3,125-lbs.

The five-passenger Special Six on exhibition is a car of 119-inch wheelbase; with 50 horse-power Studebaker demountable-head motor, improved carburetter with "hot-spot" intake manifold; cowl lights at corners of windshield; outside and inside door handles; tonneau light with extension cord; 32 by 4-in. cord tires, while the Special Six four-passenger roadster seats four passengers comfortably; individual front seats are separated by an aside and there are four wide doors which eliminate crowding and inconvenience to passengers.

In the same space is shown a Maxwell and a Fiat car.



Inniss & Riddle (China), Limited

STAND No. 5

THIS concern exhibits a line of its many engineering and other specialties of British and American manufacture, foremost among which are two light type 6 and 12 horse-power "Kelvin" marine motors and two 13 and a 26 horse-power heavy type motor from the same makers. A 12 horse-power "Robey" crude oil engine; a "Universal" motor and generator from the Universal Motor Company of Oshkosh, Wis.; "Lodge" spark plugs; Fuller's "Sparta" car batteries; a "Powerlight" set with generator from Dickenson Electric Manufacturing Company driven by a Hamworthy oil engine; Bradbury sewing machines; "B.T.H." (British Thomson Houston) magnetos; gasoline brushes; "Linisher" machine; radial drills, lathes, screw-cutting lathes; hand lever bench shaping machine, etc., for garage use, from Drummond Brothers, Ltd. of Guildford, England; a complete electric plating and polishing outfit from the well-known pioneers and experts in this line, Messrs. Canning & Co., Ltd. of Birmingham, England; Berry's electric grates and "Everite" roofing. A most interesting and instructive exhibit of British products.

KELVIN MOTORS.—The "Kelvin" motor exhibit embraces various machines in sizes from 3 to 60 h.p. This motor is manufactured by the Bergius Launch and Engine Co., Ltd., Glasgow, and 3,000 British fishing vessels, as well as many motor boats used during the war on active service, which were fitted with the "Kelvin" engine testify to the severe and continuous service that can be exacted from this motor. During the war the demand for the "Kelvin" engine was unprecedented and the entire output was required for war purposes. The "Kelvin" engine has been on the China market since 1904.

ELECTRO-PLATING PLANT.—The electro-plating plant from Messrs. Canning & Co., Ltd., Birmingham, is of special interest to the garage trade. Complete plants, from the small gold and silver-plating outfits suitable for the manufacturing jewelery to large installations for garages and factories are carried in stock.

DRUMMOND MACHINE TOOLS.—One of the leading features of Messrs. Inniss and Riddle's stand is the exhibition of Drummond Brothers, Ltd., Guildford, machine tools for garage equipment in which are shown the $3\frac{1}{2}$-in. centre back geared, sliding, boring and screw-cutting lathe. With this lathe it is possible to do all repairs necessary to a motor truck, with the exception of reboring the cylinders and re-turning the crankshaft. To the above lathe may be attached the firm's new indexing, milling and gear-cutting attachment which turns the lathe into an efficient gear-cutting machine.

"EVERITE" ROOFING.—Manufactured by the British Everite and Asbestilite Works, Ltd., Manchester, is well displayed.

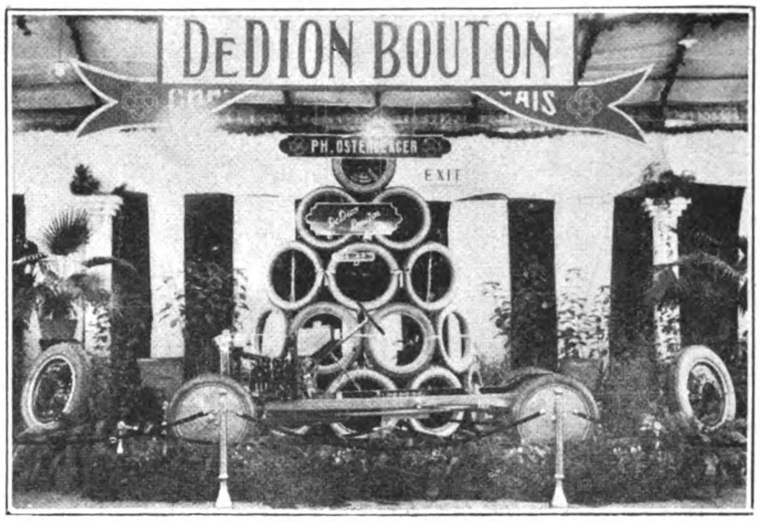
Racine & Company

STAND No. 6

RACINE & Company, one of the oldest French firms established in China, exhibits a complete autogenous acetylene welding outfit manufactured by the Far East Oxygen & Acetylene Company (Société d'Oxygene et d'Acetylene d'Extreme Orient). This company, the pioneer in autogenous welding in the Far East, was created in 1909 in Saigon and the headquarters subsequently removed to Paris. The head offices for the Far East are still at Saigon, where they manufacture principally oxygen by the Claude patented process by liquid air. The business of this firm has since spread over the Orient, where it has achieved first place in this new and important industry. The standard outfit shown by Messrs. Racine & Company is worth study and examination by

engineers and garage owners. In addition to the above, Messrs. Racine & Company also exhibit the Bergougnan tires for autos, trucks and rickshaws, manufactured by the Société Generale des Etablissements Bergougnan, of Clermont-Ferrand, France.

The products of this firm, organized in France in the early days of the automobile industry, earned in France the title of "Kings of the Road" (Rois de la Route). Théir endurance is claimed by the manufacturers to be practically unlimited and cases are reported where the chassis has worn out before the tires failed. The speciality of this company is the solid tire for heavy weights. During the war heavy guns were fitted with "Bergougnan" special solid tires and they proved very successful on the Flanders roads, and subject to the heavy wear and tear that use in such severe conditions required.



Grand Garage Francais

STAND Nos. 7, 8, 9

HERE we have a typical French exhibit, in which De Dion-Bouton, Andre Citroen cars and Michelin tires and steel wheels are featured.

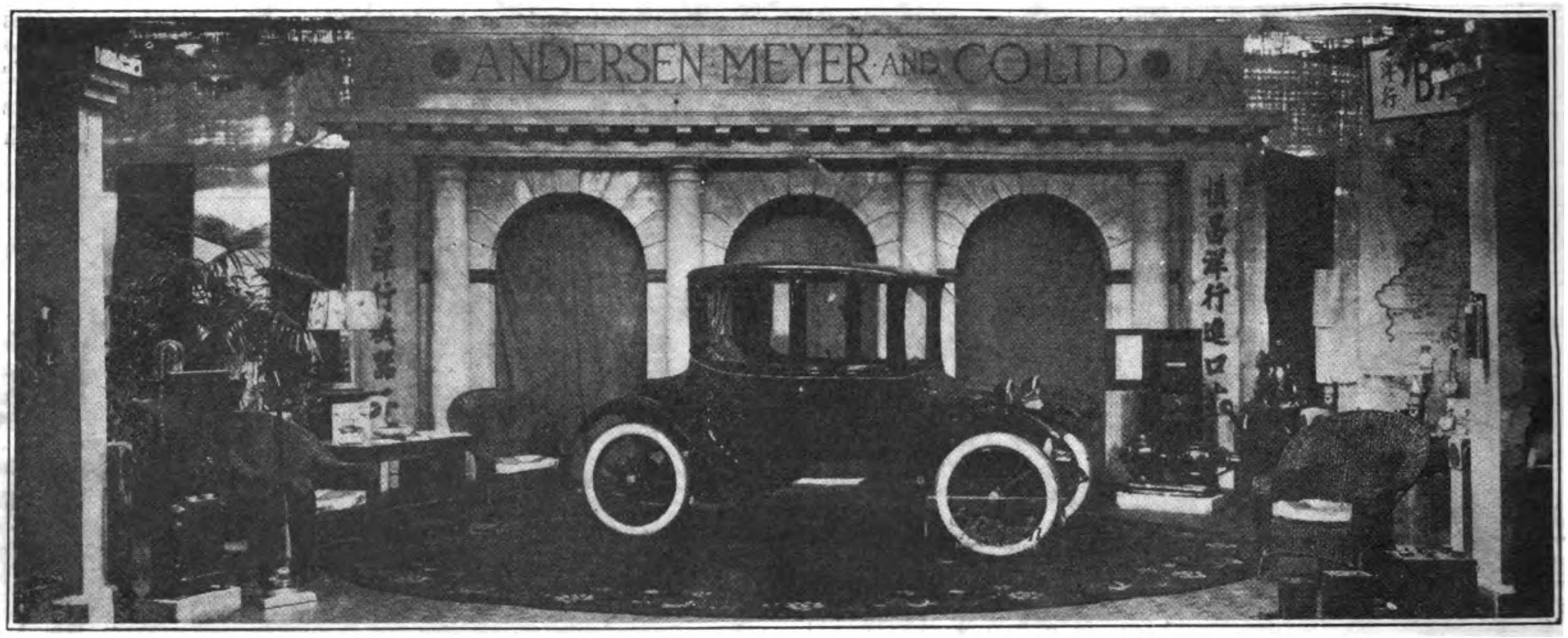
THE CITROEN CARS.—Andre Citroen factory is the best example of mass production in France, and its products are familiar sights on the streets of Shanghai and other Oriental cities. Large scale production and closely figured selling costs make it possible to deliver these cars here at figures lower than any other three speed cars on the market.

The Citroen car has the advantage of small wheels, about twenty-eight by three and a half, disks, carrying smaller tires than the Ford, and thereby offering economy in cost and maintenance. On gas, it makes better than thirty miles to the gallon.

DE DION-BOUTON.—The Grand Garage Francais is also displaying the chassis de Luxe of De Dion-Bouton, characterised by extreme simplicity of construction, featuring full cantilever springs, full floating rear axle, latest improved differential, clutch and motor.

DELAGE.—Also the Delage, the luxurious French car made with front wheel brakes. It comes in either four or six cylinder.

MICHELIN TIRES.—The Grand Garage shows a full assortment of Michelin tires, fabric and cord, straight side and clincher, in sizes ranging from those economical Citroen dimensions to those sufficient to support the heaviest truck and cargo.



Andersen, Meyer & Company, Ltd.

STAND No. 10

MILBURN LIGHT ELECTRIC CAR.—The exhibit of this company is limited solely to the Milburn electric car, one of the most elegant and popular cars in Shanghai, whose straight and level roads are peculiarly adapted for the economical running of this type of safety machine for the family. One charge is sufficient for the longest drive through city and environs. A general electric home charging outfit, which can be purchased with the car and attached in the home garage by means of a plug, with the same simplicity as that which connects up the family iron, is also exhibited with the car. It charges while you sleep (no harm car be done by letting the current run on after it is fully charged), and is ready to go at touch of the throttle next morning.

With a Milburn electric, there is no radiator freezing, no locked cylinders, no flooded carburetter, no hesitating motor to coax on a cold morning. The chauffeur can be dispensed with and no nerve-racking driving lessons are necessary. One movement of the starting lever, and you are away, silently, swiftly, safely. It obeys your slighest guidance as if by instinct.

Milburn offers a choice of velours and plushes in variety of designs. The luxurious softness of cushions is never lost, while the exterior represents the highest development in the fine art of body finishing.

An illustration on page 24 shows the pretty car on its way to Woosung, which trip was made in about forty-five minutes. Many electrics bought for the exclusive use of the women of the family have been promptly confiscated by the men of the household and appropriated for use in going and coming from the links.

Andersen, Meyer have a *clièntele* which pronounces the Milburn one hundred per cent. satisfactory.

* * *

Barlow & Company

STAND No. 11

EXHIBITING a line of carriage and other lamps made by Wyncott & Son, Birmingham, England.

Good Roads Movement.—In this stand is also the desk of the good roads movement of China, an association created for the purpose of encouraging the building of modern highways throughout this country. The organization does not build roads. Its main purpose is to create a public consciousness favorable to this great reform, against which there has hitherto been opposition for traditional reasons. The education of the people is perhaps the most difficult task in road building, a task that the association has taken upon itself. This movement has as its Honorary Secretary Mr. George E. Sokolsky, of the Shanghai *Journal of Commerce*, assistant director of the government bureau of economic information, and connected with other Chinese commercial bodies. A set of maps drawn by Mr. S. J. Powell, the well-known engineer, adorns the walls of the stall, showing the proposed new roads in various provinces. The movement needs and merits the support of Chinese and foreigners. Its work benefits all.

* * *

The Texas Company

STAND No. 12

THE Texas Company is an ever growing organization which is carrying the red star and green T into all quarters of the globe and to every place where the state of civilization is high enough to require the use of kerosene oil for light, heat and power, and lubricating oils for the lubrication of many and varied kinds of machinery which manufacture other necessities in life.

"TEXACO" implies service and the Company enjoys the reputation of always giving the maximum consideration to its consumer's requirements. This means not only providing goods of the best quality but of placing them on the market in the most up-to-date packings.

Since The Texas Company commenced operation in the fall of 1916, and notwithstanding the many difficulties to be overcome, the Company expanded until now it is one of the leading factors in the distribution of petroleum products in all of the principal towns in China. The merit and high quality of the texaco products have greatly impressed the buying public in this country and to such an extent that texaco sales are only limited by available supply.

To adequately describe the different products marketed by this Company and to mention specific conditions under which they are made, would almost require a separate publication for each product. However, we may volunteer a little information which doubtless will give some idea of the extent and character of Texaco products.

Each texaco product is manufactured for a specific purpose and its fitness for recommended use is fully determined by practical tests before being placed on the market; the crudes are carefully selected and the method of manufacture is scientifically conducted so as to bring out the valuable characteristics of the oil. Consequently, the study and experience given to the thousands of problems involved in the use of petroleum products, is made available through the use of texaco petroleum products.

The number of products marketed by The Texas Company have increased from time to time until practically every petroleum product is now included. The Texas Company's chief products are texaco auto gasolene; texaco kerosene, "Sing" and "Yinfoo"; texaco naphtas prepared for varnish and paint work requiring quick evaporation; texene or texaco spirit, a mineral terpentine, excellent as a mineral thinner for varnish and paint work.

Texaco lubricants are made in different classes for all lubricating requirements; texaco cylinder and valve oils, engine and machine oils, motor oils, marine oils, railroad oils, textile oils for textile machinery. Air compressor oils for high, medium and low-pressure compressors; texaco crater compound for lubricating different classes of gears, wire ropes and chains exposed to excessive heat, dust, salt water and chemicals; texaco lubricating oils specially prepared for electric transformers, hydraulic systems, ink stocks, twine oil, harness oil, tempering oil, cutting oil, etc. Texaco greases are manufactured for all purposes where grease may be used to advantage; transmission lubricant, possessing high lubricating value, will keep the gears of motor cars running smoothly and reduce noise and frictional wear. Home lubricant for use in every home in lubricating sewing machines, phonographs, etc.; refined wax for candle making, etc.; texwax, texaco roofing and texaco asphaltic paint, an excellent paint for iron fences, metal roofing, iron girders, smokestacks and all metal surfaces requiring a durable paint coating.

The Texas Company maintains competent lubricating engineers in every district, whose duty it is to go over plants, investigate all conditions, make recommendations as to the most suitable lubricants to be used and the best method of handling and applying them.

The head office of The Texas Company in China is located at 128 Szechuen Road, Shanghai, with branches at Hongkong, Canton, Amoy, Chinkiang, Wuhu, Hankow, Tsingtao, Tientsin, Dairen, Mukden, Harbin and Chemulpo, Korea.

* * *

"Remember its Waterproof"

A. Arnaud-Coste and R. V. Dent

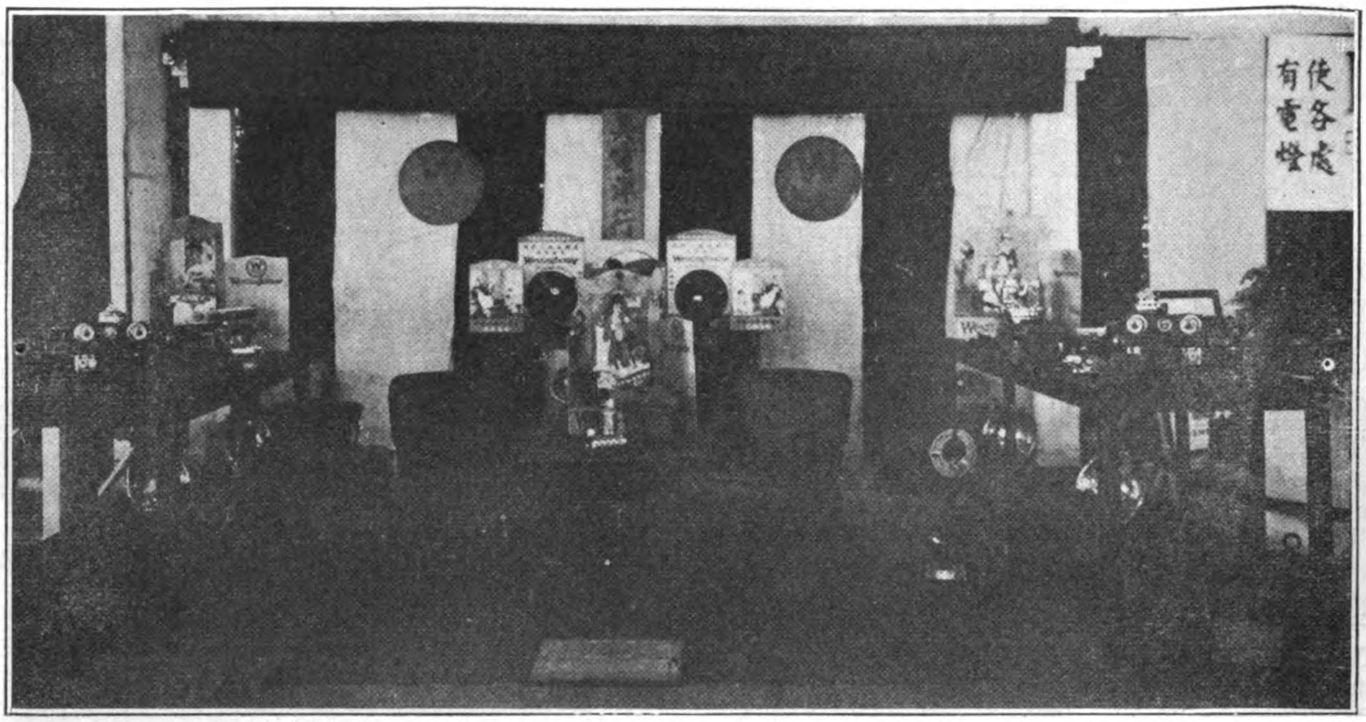
STAND No. 13

THE exhibit of this company is confined to the water-proof and anti-corrosive paint specialties of Toch Brothers, 350 Fifth Ave., New York. It shows Toch Brothers water-proof paint and "Tocholith" anti-corrosive paints for garages, etc.

B. F. Goodrich

STAND No. 14

EXHIBIT of the celebrated Goodrich tires.



Westinghouse Electric International Co.

STAND No. 15

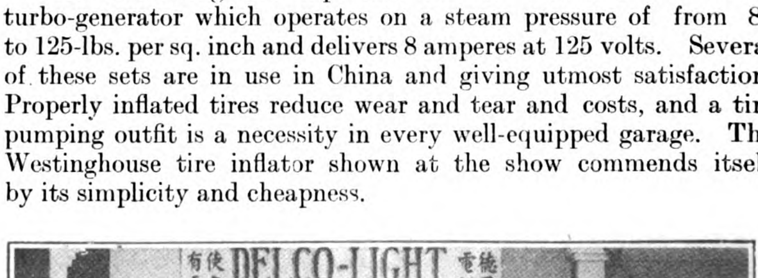
THE exhibit of this great American electrical concern is confined to minor products and accessories in keeping with the demands of the automobile trade and the home. The entrance of this firm into the Chinese field with their own office and representative is of too short a duration to have accomplished any important installations such as are found scattered all over Japan and other parts of Asia, and their activities at the motor show were largely educational in order to familiarize the Chinese with their name and products. The short comprehensive resumé of facts about the Westinghouse plants, products, subsidiaries and factory system, prepared by their local representative and distributed at the show did much to acquaint the Chinese with the Circle "W" chop and what it stood for in service and efficiency.

The names of the Westinghouse industries and their ramifications comes as an eye-opener even to better informed engineers, who will be interested in the following list :—

American Brake Company ; The Bryant Electric Co.; Canadian Concrete Products Corporation ; Canadian Krantz Electric & Manufacturing Co., Ltd. ; Canadian Westinghouse Co., Ltd.; Cutter Co., George ; East Pittsburgh & Wilmerding Coal Co.; Fountain Electrical Floor Box Corporation ; Interborough Improvement Company ; Krantz Manufacturing Company ; The Laurentide Mica Co., Ltd., Locomotive Stoker Company ; Mansfield Vitreous Enamelling Co ; Massey Concrete Products Corporation ; Milwaukee Locomotive Manufacturing Company ; National Brake & Electric Company ; National Steel Foundries ; National Utilities Corporation ; New England Westinghouse Company ; Nuttall Co., R. D. ; The Perkins Electric Switch Manufacturing Co. ; The Pittsburgh High Voltage Insulator Co.; Pittsburgh Meter Co.; Safety Car Devices Co. ; South Philadelphia Co. ; Turtle Creek & Allegheny River R. R. Co. ; Union Signal Construction Co. ; The Union Switch & Signal Co. ; United Pump & Power Co. ; The Westinghouse Air Brake Co. ; Westinghouse Air Brake Home Building Co.; Westinghouse Electric International Co. ; Westinghouse Electric & Manufacturing Co.; Westinghouse Electric Products Co.; Westinghouse Friction Draft Gear Co.; Westinghouse Gear & Dynamometer Co.; Westinghouse Inter-Works Railway Co.; Westinghouse Lamp Co.; Westinghouse Pacific Coast Brake Co.; Westinghouse Traction Brake Co.

Amongst the products exhibited having special interest for the garage and automobile trade was a foolproof and fireproof motor starting switch designed expressly for use in garages and other places where there is danger of fire. This switch is hand operated, immersed in oil and totally inclosed. There was also a complete range of Westinghouse lamps ; a 1/6 and 1/4 h.p. Type "CD" motors which can be supplied for use on a 32-volt direct current circuit ; chafing dishes, curling irons, standard toaster stove ; turnover toaster ; cosy glow radiators ; 3 and 6-lb. electric irons ; coffee percolator ; nursery milk warmers ; warming pads, etc. Mogul light projectors for general interior or exterior flood lighting ; 1/8 and 1/4 h.p. type "CA" motors which can be supplied for use on either 110 or 220-volt alternating, single-phase or 50-cycle currents. A motor generator set for charging automobile storage batteries which are made for charging batteries of any kind, type or any number of cells, a necessity for every garage. There was also an automobile engine heater which keeps the engine warm in cold weather while laying in the garage making it easy to start. This saves electric power from the storage battery and gasolene. It uses the same power as an ordinary lamp. The exhibit also displayed single-phase transformers, 9 h.p. type "SK" motors and a rectigon. This apparatus is the latest development for charging an automobile storage battery. The one on exhibition has been in use in Shanghai for over two years.

An interesting and important exhibit was a 1 kw. steam turbo-generator which operates on a steam pressure of from 85 to 125-lbs. per sq. inch and delivers 8 amperes at 125 volts. Several of these sets are in use in China and giving utmost satisfaction. Properly inflated tires reduce wear and tear and costs, and a tire pumping outfit is a necessity in every well-equipped garage. The Westinghouse tire inflator shown at the show commends itself by its simplicity and cheapness.



Fearon, Daniel & Company

STAND No. 16

HERE we find an interesting exhibit of the "Delco" lighting units, manufactured by the Delco Company of Dayton, Ohio. These include a 3,000 watts, 32 v battery plant; another 3,000 watt, 110 v. non-battery plant with a capacity of 150 twenty watt lamps; another 2,500 watt kerosene engine generating set of 160 amper hours, 110 volts, with battery. Storage batteries; Victor portable stereoptican from the Victor Animatograph Company of Davenport, Ia.

Olivier & Company

STAND No. 17

EXHIBITING models of the French "Unic" car and the "Verax Fire Extinguisher," for which they are agents in China. The Unic car is manufactured in several types ranging from the ordinary touring car to commercial trucks. The 13-24 h.p. "Unic" chassis can be fitted with several types of bodies, and the result is a pleasing and attractive car with an engine which fulfils all the requirements exacted of it. The popular styles are seven-seater touring, coupé de luxe, landaulette, six-seater sedan and the four-seater torpedo, all with a 13-24 chassis.

* * *

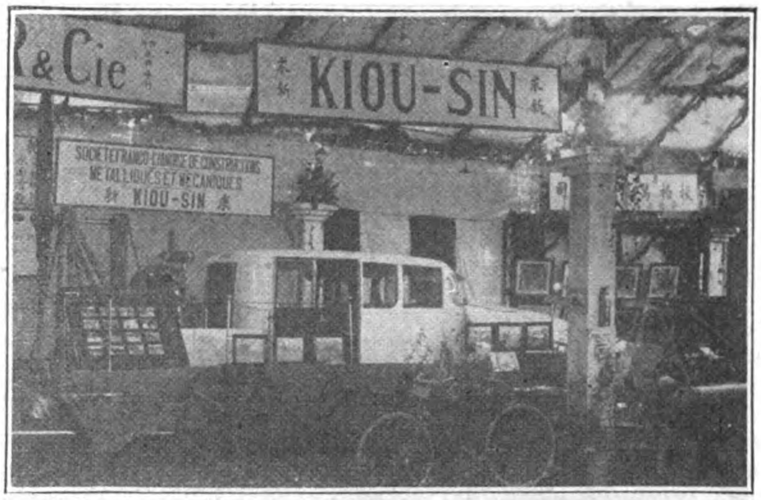
Societe Franco-Chinoise de Constructions Metalliques et Mechaniques

STAND Nos. 18, 19

EXHIBITING two hydrosliders, of which several are now operating on Chinese rivers.

These hydrosliders are built by the Ste. Ame des Hydroglisseurs de Lambert at Nanterre (Seine), a well-known French firm, in varying sizes and speeds, the latter covering from fifty-five to ninety kilometres per hour.

One of the boats has been sold to the governor at Canton, where it has proved its reliability and high efficiency. Another is being used for the purpose of carrying on regular trips on the upper Yangtze between the cities of Ichang and Chungking, and it is



further planned to establish regular communication on the shallow rivers in the interior by hydrosliders on a large scale.

Much attention is being paid to these watersliders of immense speed in most of the European countries. During the war they rendered excellent services to the French and British armies, as well as to their expeditionary forces in the colonies. So they were used for fighting purposes and as means of communication in Mesopotamia.

It will give an idea of their efficiency to state that the trip from Bagdad to Bassora on the water which takes at least 12 days was easily completed by them in 24 hours.

Being of a very slight draft, they are especially fit for navigating the typically shallow Chinese rivers, for the transport of passengers and articles of light weight. By their light draft they are not at all affected by strong currents and in rapids, and lose under most trying circumstances neither in speed nor in manageability.

This new type of shallow draft boat comes to solve many of the problems attending the navigation of China's inland streams and rivers. The Societe Franco-Chinoise de Constructions Metalliques et Mechaniques, the new combination which took over the old and well-known machine shops and shipbuilding works of Nicolas Tsu, is pushing the use of these boats in the upper Yangtze regions and news comes of two river navigation companies organized in Szechuan which will employ hydrosliders.

This exhibit, although poorly shown, is one of the most interesting features of the show.

The possibilities offered in China for these boats has brought other French concerns into the field, and we find the Dumont-Galvin hydroslider represented by Chapeaux Freres, 4 and 5 French Bund, Shanghai, an active competitor.

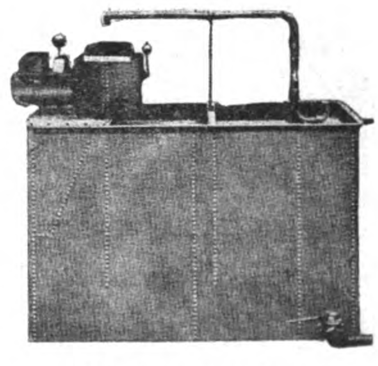
* * *

Babcock & Wilcox, Ltd.

STAND No. 20

THIS company has a model of its well-known water-tube boiler, tube cleaner, ventilator and blower and an automatic water purifier.

This water softener has been designed for the purpose of removing, by chemical means, the scale-forming matter from water prior to its use, thereby preventing damage to boilers, etc., from the accumulation of incrustation, at the same time effecting a large saving in fuel consumption by keeping all parts of the boiler heating surface in a clean and thoroughly efficient condition.

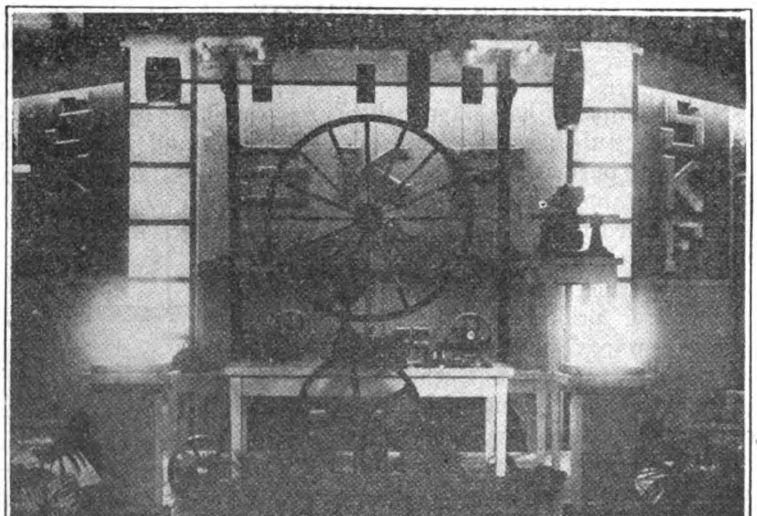


B. & W. Water Softener

It is extremely simple in its working, and the arrangement for mixing the chemical reagents with the water insures most reliable results. The apparatus works quite automatically, the supply of water to the softener being regulated by a float valve, and the chemicals being added by a patent automatic measurer.

If a supply of exhaust steam be available it can be utilized for heating the water, thereby shortening the time of treatment, enabling a smaller apparatus to be used for a given quantity of water softened, and making the plant a combined water softener and feed-water heater. If no steam be available, however, water can be equally treated in the cold.

Over 4,500 of these softeners are now in use all over the world in various industries, such as: Electric light stations; collieries; cotton mills; laundries; railways; mines; silk dyeing works; breweries, etc.



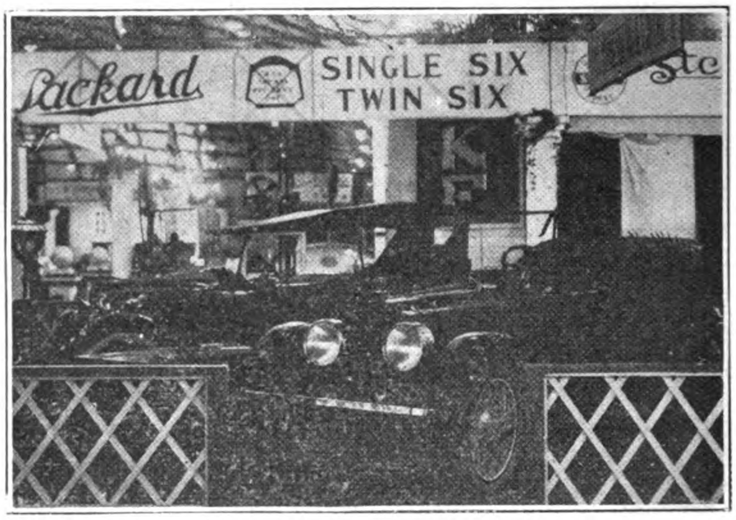
In this country of hard waters, filled with impurities of all kinds which make for scale and other incrustations in boilers which diminishes their efficiency, the B. & W. water softener offers a most practical remedy.

* * *

Chinese S. K. F., Limited

STAND No. 21

THIS is an extremely interesting and well-displayed exhibit of the justly famous patent ball-bearing specialties, manufactured by the Aktiebolaget Svenska Kulagerfabriken, of Gothenburg, in Sweden.

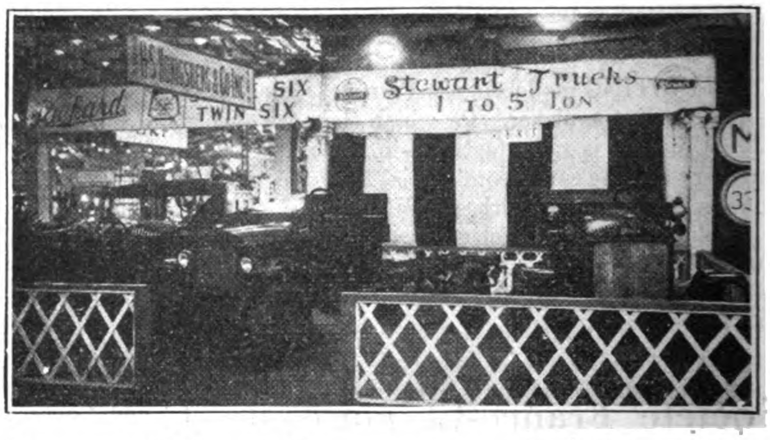


Packard

Exhibited by H. S. Honigsberg & Co., Inc., Agents

STAND No. 22

DISPLAYING a model of the single-six, one of the most beautiful of American designs and a twin-six, another classy car. Both of these models are carried in stock by the agents.

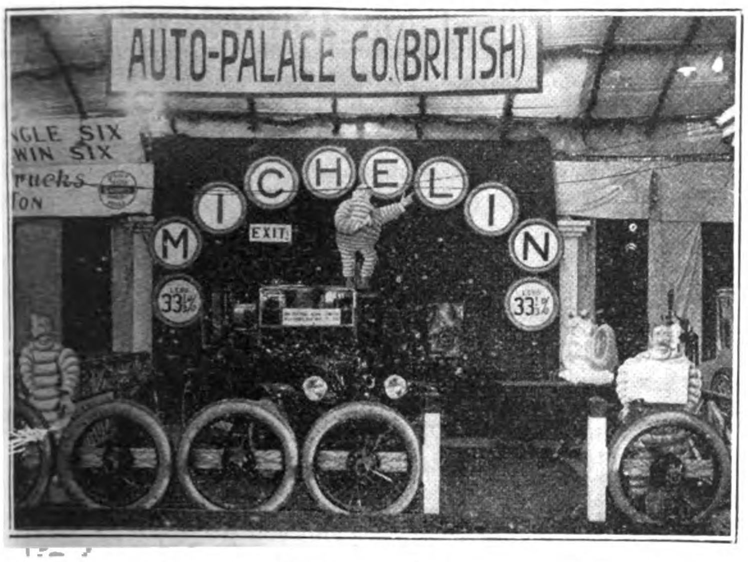


Stewart Motor Corporation, Buffalo, N.Y.

H. S. Honigsberg & Co., Inc., Agents

STAND No. 23

SHOWING two models of the Stewart one-ton quality truck. These handy trucks are made in various shapes for special purposes, such as delivery and express, covered, open or stake body, and for coal and contracting hauling with special steel dump body. Only the choicest ash, white wood, and hard pine, heavy gauge sheet steel and forgings and castings of proven quality enter into their construction. Frames are heavily ironed. They have graceful, distinctive lines, and brilliant, rich finish and are built for long service. "An Engineer's Masterpiece."



Auto Palace Company

STAND No. 23

FEATURING Michelin tires, Renault cars and Douglas motor cycles.

A magnificent 12-16 h.p. Renault limousine was exhibited by the Auto Palace, a British concern, the oldest garage in Shanghai. Another important exhibit was a Douglas motor car cycle, made by the firm whose motor cycles were used so extensively by the war office in all theatres of operations during the great war.

The Auto Palace also displayed the Oleo plugs, of French make, and a number of special designs of the Michelin tire, particularly of the corded variety which have proved extremely popular for some years past. The garage management of this company act as agents for the Renault cars, and exhibited one of the latest type, complete with electric lighting installation and starter, and h.t. magneto. The consumption of petrol by this car is 15 miles to the gallon. The Auto Palace Company deal chiefly in second-hand rebuilt cars, exhibited at the Auto Palace on Avenue Joffre.

Anglo-Chinese Engineers' Association, Limited

STAND Nos. 24, 25

IN Stand No. 24 this company exhibits three fine "Bean" cars from Harper Sons & Bean, Ltd., and "Triumph" motor cycles with sidecars.

The "Bean" car formerly was known as the "Perry." The present "Bean" is an improved and enlarged model, and it is claimed to be one of the most up-to-date and lowest priced cars of British manufacture for its size.

One of the models is a four-seater touring car with standard body, a two-seater coupé, and a two-seater sports type, whose petrol consumption is 28 miles to the gallon.

Two "Triumph" motor cycles, for which the company are agents, are also shown. Each cycle is the 4 h.p. model with belt drive, and one is a combination with a sidecar.

In Stand No. 25 are many interesting and useful engineering exhibits well worthy of careful investigation of prospective purchasers. Here are seen two generating sets with switch boards, the dynamos being from the Crypto Electric Company of London driven by a Dixon Brothers & Hutchinson, Ltd., Southampton, oil engine; a 25 h.p. crude oil two-cylinder marine motor, from the Invincible Engine Company of Keighley, England; a 20 h.p. Dixon Brothers & Hutchinson, Ltd. crude oil marine motor; a Crypto battery charging set; garage lathes and machine tools and electric fires.

Beldam Tyre Company

STAND No. 27

THE Beldam Tyre Co. (1920), Ltd., of Brentford, Middlesex, England, are bringing on the China market, through their agents, the North China Produce and Import Co., 39a Canton Road, Shanghai, one of the few all-British tires sold in China.

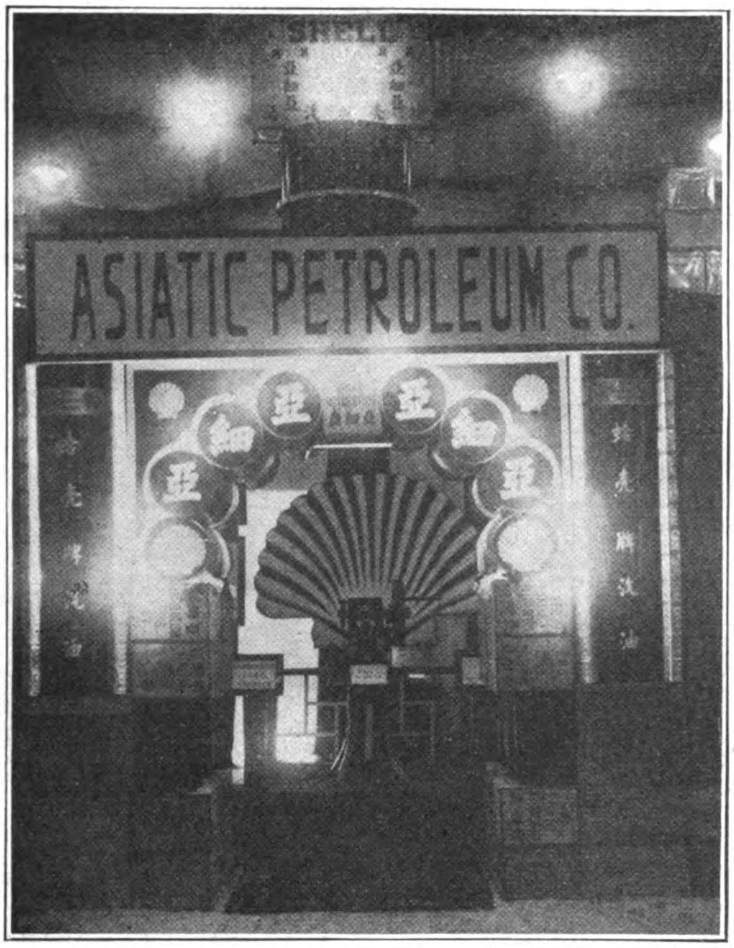
The exhibit shows the Beldam "Bull Dog" tire, conspicuous by its appearance and finish. The flexibility of the "Vs" along each side of the tread is claimed to lead to long life and to prevent the tendency to skid by wedging themselves between the casing and the road. Beldam "Bull Dog" tires are immune from punctures, their construction being covered by patents. The "Bull Dog" tire is the famous original "Beldam" design, the result of exhaustive experiments made by the late Mr. G. W. Beldam, originator of the tires and founder of the Beldam Tire Co., which started operations in 1909.

Another tire shown is the "Beldam" combination "V" steel-studded tire, constructed to insure absolute immunity from punctures and skidding in any weather and on all road surfaces, the rubber "Vs" counteracting slipping on dry and the imbedded steel studs insuring safety on wet, slippery roads—an ideal combination. A section of this tire is shown by the exhibitors.

The "Beldam" inner tubes which are shown are all of the heavy, red rubber type, specially moulded and strengthened on the parts next to the rim, exposed to the most wear and tear. "Beldam" motor cycle tires, all 4-ply, old favorites with the motor

cycling world at home; are built on the lines of the motor tires, but they have an additional groove to take up circumferential slips. The motor cycle tubes are of the butt-ended type.

Most of the tires shown are clincher types, as owing to the company's heavy government contracts the installation of the machinery for the manufacture of straight sided tires was, unfortunately, delayed. The 32 by 3½ straight tire is on the market, and is exhibited, however, and further sizes will soon be available. "Beldam" casings are built up on the finest Egyptian cotton fabrics; special attention being given to strong walls.



Asiatic Petroleum Company, Ltd.

STAND No. 28

DISPLAYING their various brands of shell oils and spirits, with photos of their Shanghai, Chinkiang and other installations in China.

* * *

Lee & Lee Garage

STAND No. 29

DISPLAYING an Albert and Willys-Knight car and Lee tires.

* * *

Standard Oil Company of New York

STAND No. 30

SOCONY products have played no inconsiderable part in the progress of the great automotive industry, the triumphs of which were so splendidly exhibited recently in China's first automobile show. Of timely interest indeed was the model Socony asphaltum road exhibit shown in the Company's booth near one of the main entrances of the exhibition building. The construction of an asphaltum road was clearly shown in miniature to thousands of interested Chinese visitors. By means of a scene in the background the road was made to disappear into the distance, opening up the beauties of a typical bit of Chinese landscape. No Chinese beholder could fail to be affected by the powerful suggestion produced by this picture—of the potential and undeveloped possibilities of a country in which all sections are closely united by a network of good roads and rapid communications, thereby ensuring the close and more sympathetic acquaintance of the citizens of different districts, and fostering the national sympathy and organized force of national opinion indispensable to a country's unity and prosperity.

The subject of good roads in China was investigated and studied by the Socony engineers for many years before any practical constructions were undertaken. The problem to be solved was the construction of an economical pavement composed of asphaltum

and available local materials so blended as to withstand successfully the shock and stress of heavy Oriental traffic. After several years of preliminary investigation, involving a thorough study and analysis of local road building materials available in various districts, four standard forms of road construction were evolved, that are now in common and extremely satisfactory use in the largest treaty ports, namely,

(1) Surface painting
(2) Asphalt macadam
(3) Asphalt concrete (stanocrete)
(4) Sheet asphalt

The first two forms did not differ essentially in method from the standard European and American practice, but the sheet asphalt and asphalt concrete constructions were specially modified and improved compositions of asphalt and local material that would give a compact, resilient, and extremely durable wearing surface under the heaviest forms of Oriental traffic. The stanocrete or asphalt concrete construction being the more generally preferred to the sheet asphalt, as the slightly longer wearing qualities of the sheet asphalt are counterbalanced by the higher cost of construction.

Both the asphalt concrete and sheet asphalt pavements have successfully withstood the shock and stress of heavy traffic in the large treaty ports for from seven to ten years at a practically negligible maintenance cost. Many thousands of square yards of the asphalt concrete pavement have already been laid by the Shanghai, Peking, Tientsin, Hongkong and Hankow municipalities, and in every case the durability of the pavement has supported the original claims for this type of construction.

In addition to road work, asphaltic compositions are extensively used for roofing, water proofing, coating drain pipes, in the construction of tennis courts, sidewalks and as a mastic for breakwater joints and underwater constructions.

The Company maintains a special force of engineers whose services are at all times available to interested parties desiring information or recommendations for the use of asphaltum in conjunction with engineering problems.

* * *

Wah Chang Trading Company

Featuring Nash Motors, Miller Cord Tires and Prest-o-Lite

STAND No. 32

NASH MOTORS.—The Nash cars manufactured by the Nash Motors Company of Kenosha, Wisconsin, U.S.A., are shown in several types, such as the two-passenger, the five-passenger, the seven-passenger, the four-passenger "Spot" model, the four-passenger coupé and the seven-passenger sedan, fitted with the Nash perfected valve-in-head motor, marks a distinct advance in motor engineering. The one ton, and Nash quad types, possess the distinctive degree of perfection which the Nash motors possess. These are also shown by the Wah Chang Corporation, and for the rough use and long, severe service demanded of a motor lorry in China, where roads are in a frightful condition, except inside the Settlement, the Nash truck should prove most satisfactory.

STORAGE BATTERIES.—The Prest-o-Lite storage batteries made at Indianapolis, Ind., are also included in the Wah Chang Trading Corporation's exhibits. Power capacity and long life, are the three great essentials of a storage battery, and the manufacturers claim all these qualities in their battery, which was originated long before the storage battery came into use. Each jar is hand-inspected to an electrical test of 22,000 volts before being passed. Prest-o-Lite batteries have a correct size for every car.

MILLER TIRES are also on exhibition. The manufacturers claim their record of mileage on all tires, and their margins of service place the Miller tire very high in the popular estimation. They are subjected to severe test in the factories and the firm claims that they so average that not one in a hundred is returned for re-adjustment.

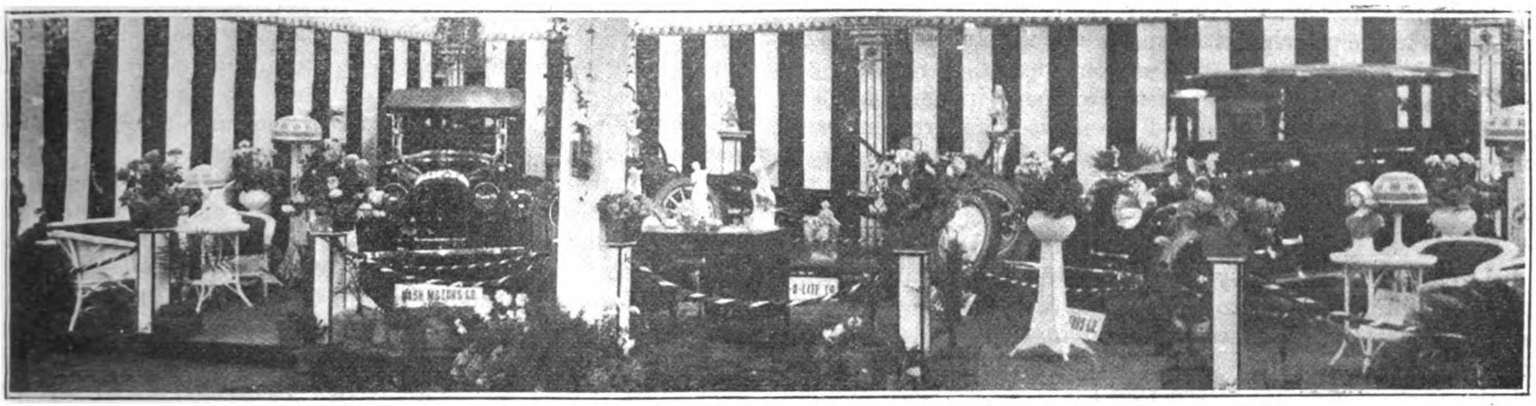


Exhibit of the Wan Chang Trading Company

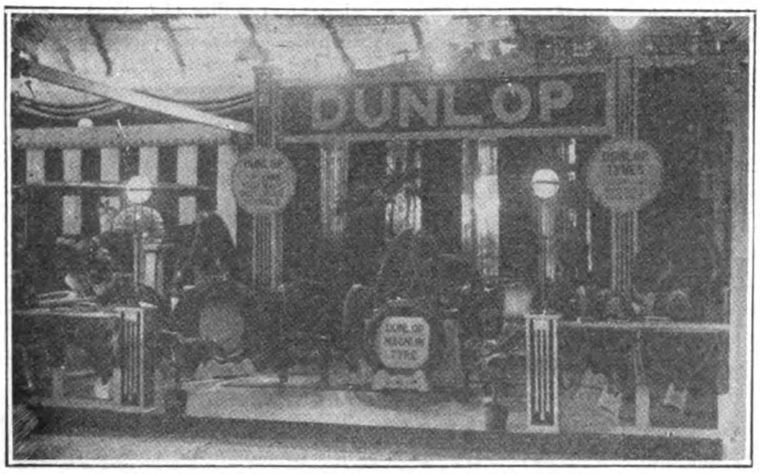
The Dunlop Rubber Co. (Far East), Ltd.

STAND No. 33

THIS stand has a complete line of the well-known Dunlop tires. The Dunlop Company was one of the first to enter the Far Eastern automobile field and has its own factory at Kobe, Japan, which supplies much of the Eastern Asiatic trade. The works and plant at Wakinohama, near Kobe, are one of the best equipped in this part of the world, employing over 1,000 Japanese workmen under direction of foreign experts. The Kobe factory and office are the manufacturing and distributing centres for the Far East. Here they act as contractors and suppliers to the Japanese arsenals for general rubber goods. In addition to tires and other mechanical rubber goods the factory turns out specialities for the chemical and surgical trade and meet with a large and increasing demand not only in Japan but other Far Eastern countries. In tires alone over 300 different varieties or sizes are manufactured at the head works in England, and stocks to the value of over $10,000,000 gold are constantly carried, in order to meet the demand for any special sizes. It is a great enterprise.

The story of Dunlop is the story of motoring. When Mr. J. B. Dunlop in 1888 invented the pneumatic tire, no one foresaw what an astounding revolution the invention would make in the world's locomotion. The invention of the Dunlop tire made motoring possible, and in doing so laid the foundation of one of the world's greatest industries.

The growth of the Dunlop organization, the pioneer company, has been phenomenal, and each succeeding year has brought forth new achievements. The capital of the company has had to be doubled and trebled in the last few years to enable the Company to carry out the big developments necessary to meet the ever-



growing demands for its products. To-day it can be said with justifiable pride that "the sun never sets" on the Dunlop factories, being, as they are, situated in almost every country under the sun.

In China, the Dunlop Company has a complete organization with offices in the principal cities and agents throughout the length and breadth of the country, and without any exaggeration it can be said that the establishment of the company in China in 1909, has, in no small measure, fostered the spirit of progress in transportation which is so essential to the development of the country—this can be seen in the nation-wide demand for better roads at the present-time.

To a large extent the success obtained by the Dunlop Company is due to the inherent quality of its products, it having always been the constant aim and care to place before their customers the very best tires that the most scientific and up-to-date plant in the world could produce. It is not the achievement of a single tire, but the average behavior of the whole output that has won for the Dunlop Company such unrivalled success and popularity which it now enjoys, and with the firm determination not to rest on its laurels but ever constantly to strive after "something better than the last" the company intend to maintain the proud position of being the first tire company in the world, and increase their prestige as time goes on.

The display Dunlop Rubber Company, in addition to the large assortment of tires and accessories, has an interesting assortment of wire wheels, including special wire wheels for the Ford.

Many of the handsome new cars on the floor of the show rest upon the splendid tires manufactured by Dunlop Rubber Company, which have been furnished by the local distributor.

* * *

John I. Thornycroft & Co., Ltd.

STAND Nos. 34, 35

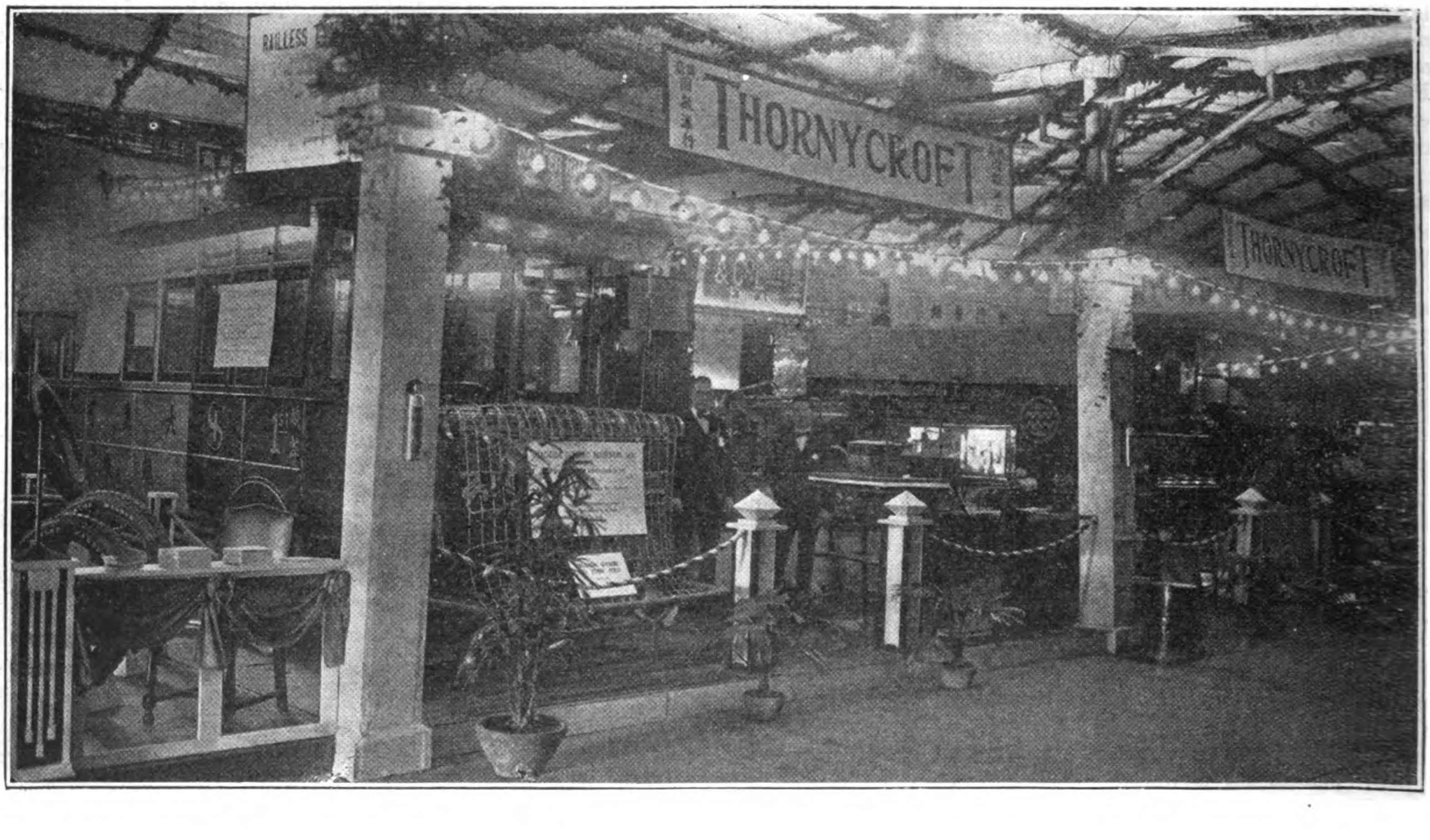
THE exhibit of this company is undoubtedly one of the best that we have seen anywhere and excels in engineering interest all the other stands in the show. Foremost in the eye is one of the new railless electric passenger cars for the Shanghai Tramway Company, with aluminium car body, Thornycroft chassis and wheels, equipped with motors from the English Electric Company and Dunlop tires.

The railless electric petrol freight car was a standard 40 h.p. "J" type four-ton Thornycroft chassis, which had an electric motor placed behind the gear box, for driving either by internal combustion engine or by electric current from an overhead wire. The chassis was jacked up in order to demonstrate to visitors the method of control and running of both systems.

The four-ton, 40 h.p. "J" Thornycroft truck supplied to Messrs. Caldbeck, Macgregor & Co. was the only complete truck in the show and has been in constant use since May 1919 and from all appearances, one would think that this was entirely new.

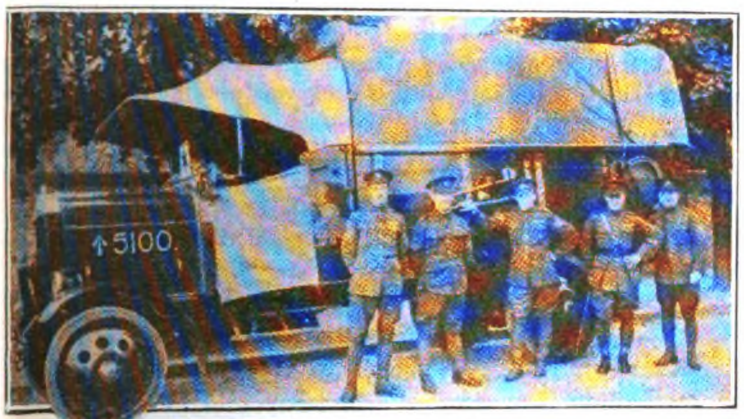
Two Thornycroft marine motors were exhibited, the 30 h.p. and 50 h.p., each fitted with reducing reversing gear, which Messrs. Thornycroft claim to be the most suitable for propelling fishing boats, tugs, barges and house-boats. Alongside the 30 h.p. the standard outfit comprising shafting, stern tube, propeller and full set of spares showing their massiveness and workmanship.

Models of patrol launches of various types and the railless tram car attracted much attention and interest, also the propellers and large photographs of marine water-tube boilers, twenty of which have recently been supplied to shipbuilders in China.



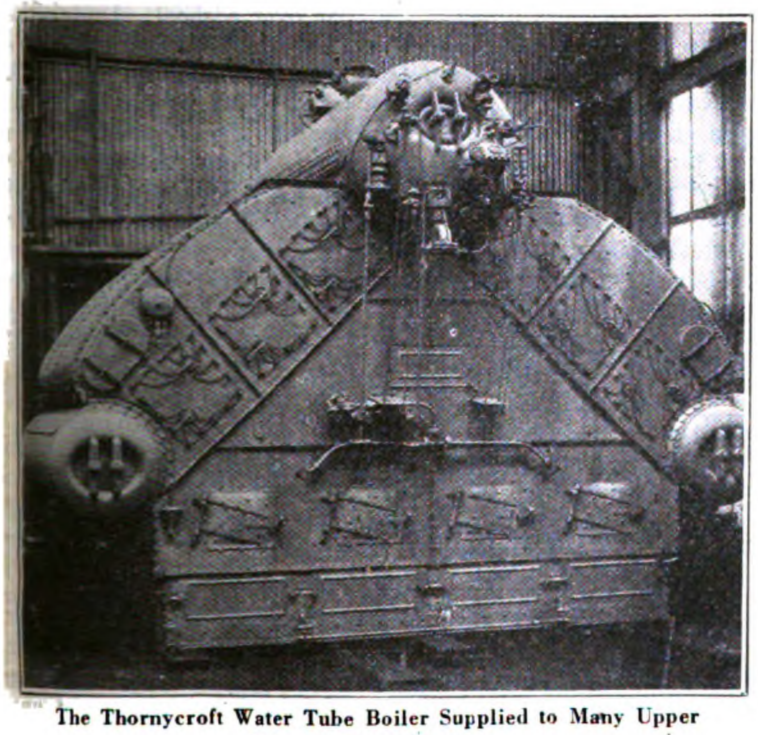
A photograph of Sir John Thornycroft, the founder of the firm, was displayed together with other views of coastal motor boats and flotilla leaders of the British navy, constructed by this firm.

Thornycroft is pushing the sale of their motor trucks in China and the Far East and have already achieved great success. Over 5,000 of these trucks were supplied to the British army in France and made a wonderful record for efficiency. One of the first of these vehicles, dubbed by the soldiers "Old Bill" Thornycroft,



"Old Bill" Thornycroft

arrived in France in November 1914 and was continually employed on the western front up to the armistice. It followed up the advance, was the first British lorry to enter Germany and subsequently won first prize in the Rhine army show at Cologne in August 1919. A truly wonderful record, one that the makers are justly proud of. The Thornycroft motor truck has made many friends and large numbers of demobilized transport officers and men, of which there are a large number in the Far East, are earnest "Rooters" for their old and tried friend of the trenches. The Indian, colonial and foreign markets are absorbing large numbers of these vehicles, and to meet the difficulties of shipment, the chassis and vehicles are sent abroad in pieces packed in the smallest possible space. In India the demand for trucks became so great after the war that a subsidiary company called the Thornycroft (India), Limited was formed and works erected at Calcutta to handle this business and urgent orders from Eastern Asia. To give service to purchasers extensive repair depôts have been established. One of these is


The Thornycroft Water Tube Boiler Supplied to Many Upper Yangtze River Steamers

in Shanghai. The scope of these trucks covers every possible use that can be put to a car. Motor omnibuses, municipal motor vehicles for all kinds of cartage, anti-aricraft mobile gun wagons, double decked buses, lorries, sightseeing cars, etc.

The Thornycroft war record is unsurpassed by any firm in the world. They were one of the first to sense the need of transport and submit vehicles for trial and the first to have a subsidy truck in active service. Their trained engineers helped to build up the great mechanical transport service of Great Britain. From the outbreak of war the government made call after call upon the Thornycroft works for trucks, and the chassis was selected as the one to be fitted with anti-aircraft guns. Special designs of cars were made for the Indian transport service, for Italy, Salonika, Egypt and South Africa. One of the records achieved was a lorry which accompanied the naval expedition which went from the rail head on the Cape-Cairo railway to Lake Tanganyika early in the war.

As in motor trucks, so with their famous launches, which were also used in all parts where British forces were fighting. In Africa and other parts, these boats have been taken through virgen forests to be set up on the inland waterways. Destroyers, coastal motor boats, transport vehicles, ammunition lorries, anti-aircraft mobile guns, depth charge throwers, submarines, salvage tugs, boom defence vessels, R.A.F., seaplane tenders and patrol boats, were turned out in big numbers. The submarine *E33* built by them proved most reliable throughout the war; their big repair department at Southampton fitted out many ships and "doctored" many others: they designed and built a special type of "Q" boat, based on their experience of tunnelled stern river steamers. Thus they rendered great assistance.

For peaceful commercial use they have their river steamers, motor boats, motor lorries and many other products to offer. The reputation they have earned under great stress, will carry them far in China, a formidable competitor to others.

Vacuum Oil Company

STAND Nos. 34, 35

EXHIBITING their various brands of "Gargoyle" oils for all kinds of lubrication. There is little to say about these well-known and widely advertised products, except perhaps to invite attention to the wonderful expansion in their use in China under the able management of Mr. Hallam, who, over a period of years, has built up this business to its present grand proportions.

The Vacuum Oil Company has four plants, two in New Jersey, and two in New York.

The largest of the company's refineries is the one in Paulsboro, New Jersey.

A few years ago the site was a peaceful homestead on the river bank. It now presents quite a different view. Numerous tanks and buildings arise around it. Along what was once a sloping beach, there is now a modern concrete bulkhead more than

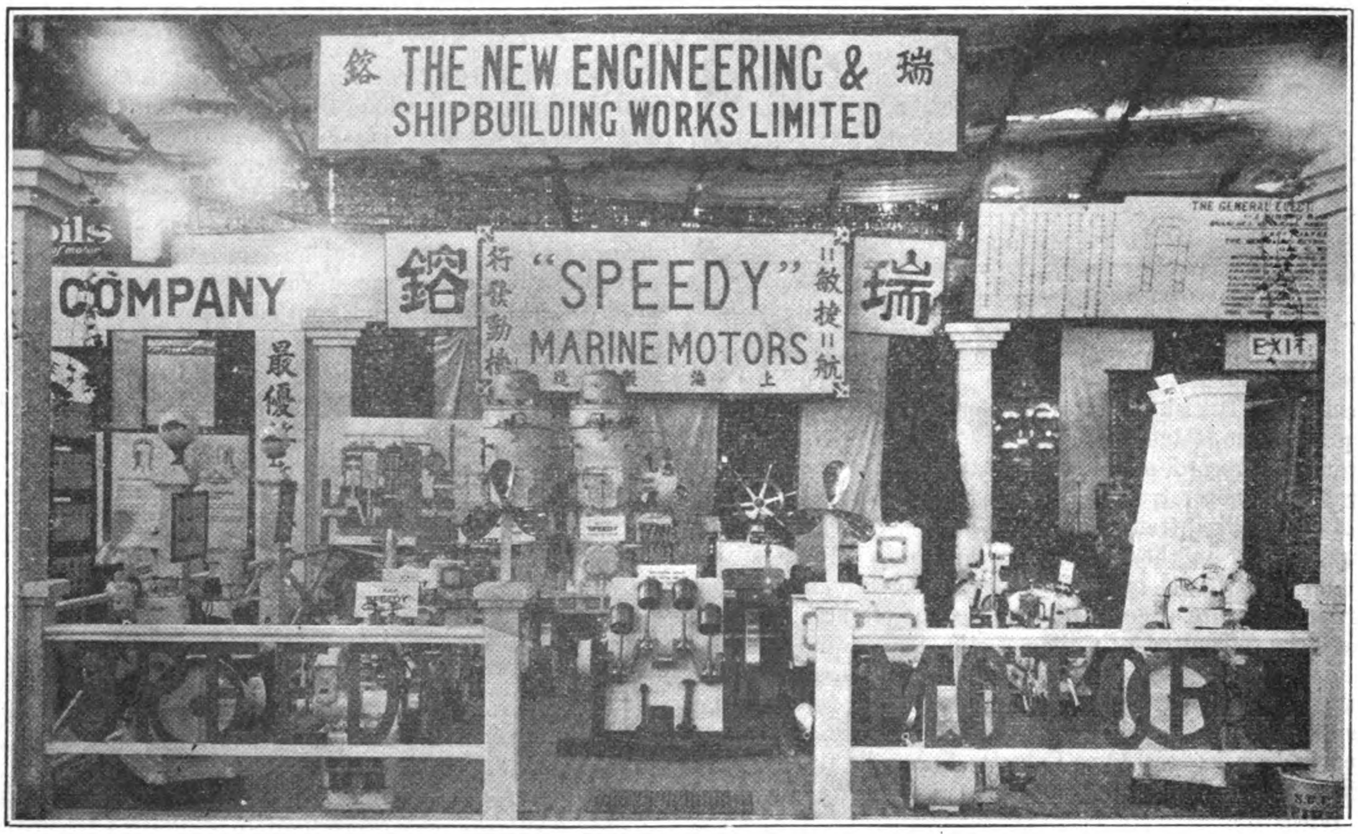
a thousand feet long, with depth of water sufficient to provide berths for the largest tank steamers afloat. There are in the tank farm now one hundred supporting tanks with capacity of over a million barrels. By remarkable engineering feat, a pipe line under the Deleware River connects these tanks with large trunk lines from the Pennsylvania oil fields. Roads have been made through the plant and about three miles of railway trackage laid, to permit of placing cars in various departments to avoid rehandling of material, and thus speed up production.

Vacuum's other three plants turn out millions of barrels of oil every year. The four plants comprise in all an area of territory equal to a good sized county.

This enormous development is cited by the Company as certain proof of the merit of Vacuum products.

boat to travel in the Grand Canal above Tsingkiangpu and the first to penetrate the waters of the Yellow River was the 50-foot Standard Oil Co.'s motor launch *Mei Foo XV* which experienced all sorts of difficulties during the eventful journey. But one foreigner, the assistant marine superintendent of the Standard Oil Co., was on the *Mei Foo XV*. Soldiers stopped the motor launch several times and difficulties were encountered because of low water, although the *Mei Foo XV* draws but 18 inches. At Hanchwang, the lock keeper refused to open the gates to allow the boat to enter Shan Lake after soldiers had stopped the launch. One lock was found open and after three anchors were laid, 100 coolies hove the launch through the lock.

When grass stopped the engines, a sail made from awnings carried the launch along until a junk was obtained as a tow. At



New Engineering & Shipbuilding Works

STAND No. 37

THE greatest surprise of the Shanghai automobile show is in the exhibit of the "Speedy" marine motors manufactured at the shops of the New Engineering & Shipbuilding Works, Ltd., in Shanghai. Here we have a complete display showing a 6, 12, 26 h.p. crude oil marine motors, single and connected to centrifugal pumps and a 3 kw. generator. It comes as a revelation even to old-timers in China to find that such remarkable progress has been made in quantity engine building right here in Shanghai. We have seen some of the excellent motors made at certain British shops in Hongkong and many of the inferior imitations turned out by the Chinese in Canton, but the product of the Shanghai company, outclasses all others made in China. In a market that imports marine motors from all the manufacturing countries of the world, it would seem that the New Engineering and Shipbuilding Works have started a competition that must be felt in the future. Proper advertising and salesmanship should create a demand for these motors, that will bring increasing returns to the makers.

Many of these marine motors are now in active service throughout the inland waters of China installed on some of the finest launches owned by the large trading companies. The first foreign

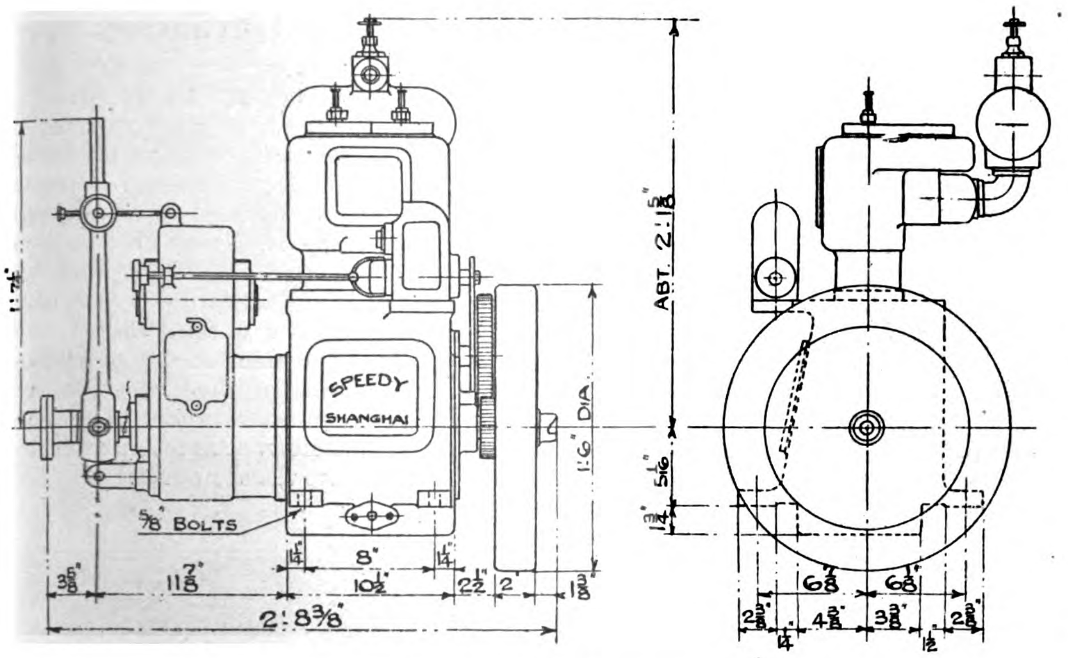
Tsining 100 coolies dragged the boat over a shoal. During the trip in the Grand Canal, and later in the Lu Ho Canal, the ship's company built dams every mile to effect a rise in the water. A native boat was sunk across the canal which reinforced a dam built of mud and kaoliang: the water was thus stopped and rose and the *Mei Foo* was able to proceed. From An Shan to the Yellow River, coolies tracked the launch ten miles in six inches of water which covered mud a foot deep. At times the coolies were up to their waists in mud and water and many were exhausted by the labor. They were taken on board the launch and given treatment. From Tsinan to Shanghai, the launch bucked heavy seas during the trip to the Gulf of Pechili and rounding the Shantung Promontory.

The principal dimensions of the M. L. *Mei Foo XV* are as follows:

Length over all	50-ft.
Beam	11
Draft	2-ft. 6-in.
Gross tonnage	25.1

ENGINES.—Two eighteen h.p. speedy motors.

A short description of these motors will not be out of place for our readers and home manufacturers. The makers say in their circular that "in introducing the speedy motors we are filling a long-felt want in the harbors and inland waterways of China and other countries for a motor of substantial commercial type



DIMENSIONS OF 6 H.P. "SPEEDY" MOTORS

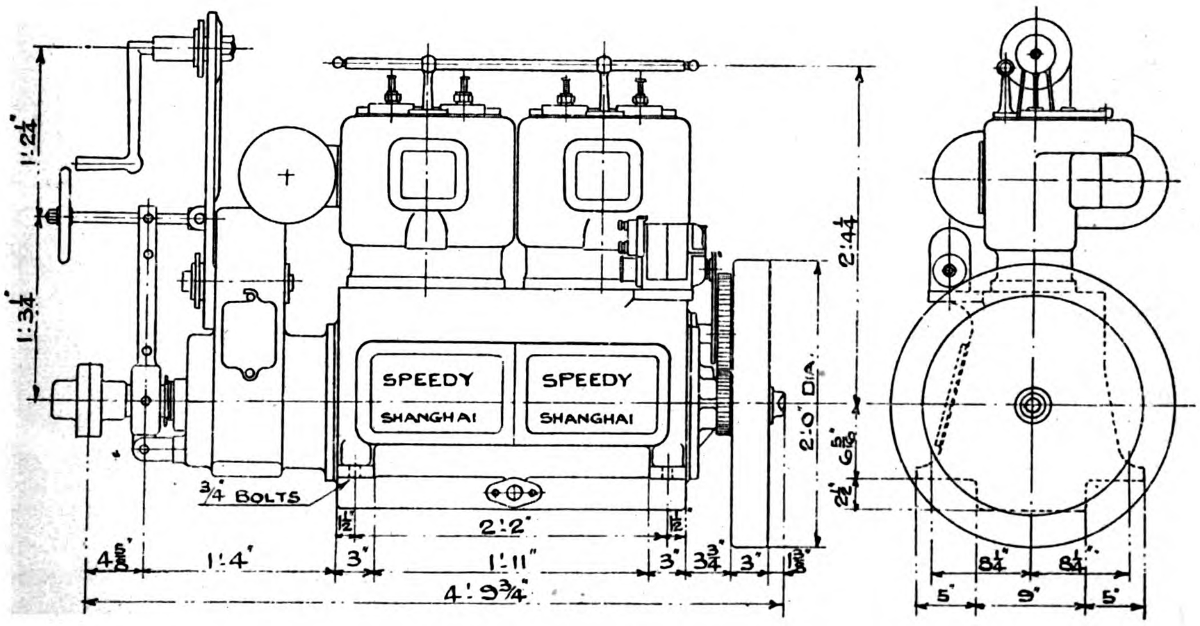
where motors have to be handled by native labor and operated on the cheapest grade of oil. Our belief in moving with the times is to improve in designs and thus endeavor to give our purchasers the latest and best engines obtainable.

"Briefly we place before our clients the outstanding advantages of this motor. The all important feature being the successful running and correct lubrication of moving parts. In China, as is well known, we have to meet the two extreme temperatures and to deal with this, the system of lubrication being splash, we have adopted the following method:—A water jacket is cast on the bottom of the crankcase which is connected directly to the sea or river and through which all the circulating water passes, in doing so it cools off the lubricating oil (which becomes heated through the lubricant coming in contact with the hot piston and cylinder walls), therefore the lubricating qualities of the oil are unimpaired. The crankcases are divided into separate compartments for each two cylinders, each chamber being fitted with ribs in such a way as to cause a continual circulation of lubricating oil. The centre or middle main bearing is fastened into a machined recess in the centre of the crankcase with eccentric washers making it adjustable and all main bearings are lubricated internally by wire ducts. The crankshaft is fitted at both inside ends with ball thrusts which keep the connecting rod bearings and pistons in perfect alignment, thereby enabling the engine to be placed at any reasonable angle.

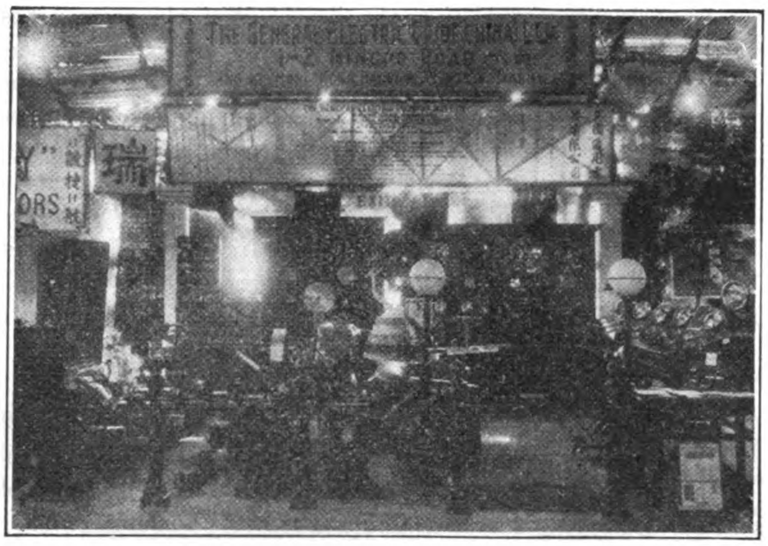
"The circulating water is drawn from the water jacket at the base of the engine by circulating pumps and discharged into a copper pipe common to all cylinders, entering the cylinder at the bottom of the water jacket around which it becomes deflected and is then discharged at the top through a copper pipe into the silencer. With this system it is impossible to have one set of cylinders hot and others cold. Again, the circulating water discharge pipe standing well above the tops of cylinders makes it impossible to create a steam pocket to interfere with the successful circulation of cooling water which might otherwise exist. On each pump telltales are fitted which indicate at a glance if all the pumps are working.

"Speedy engines start direct off the magneto without the aid of coil or accumulators. The reliability of the "Speedy motors" which have made them so successful in the past, is due to the above facts as also that the best of material and workmanship is put into the entire construction, and in their manufacture. It is not our desire to compete with the cheapest makes of marine motors, but to give our purchasers the best value obtainable for full power work without expensive breakdowns and repairs.

"All speedy motors are manufactured in Shanghai thus ensuring the replacement of any requisite spare parts at all times and prospective customers or their interested parties are invited to inspect these engines in course of construction and receive practical demonstration of what these engines are capable of accomplishing. These engines are made in various grades of horse-power ranging from 6 B.H.P. upwards and are particularly adaptable for small and large motor boats, houseboats, ferry launches, tugs, etc. A large number of speedy motors have already been supplied to leading firms and residents in Shanghai and elsewhere in China, where they have given entire satisfaction, amongst whom we may particularly mention the Asiatic Petroleum Co., Ltd., Messrs. Butterfield & Swire and the Standard Oil Co. of New York."



DIMENSIONS OF 26 H.P "SPEEDY" MOTORS



General Electric Co. of China, Ltd.

STAND No. 38

THIS exhibit is also one of general engineering rather than of interest to automobile lovers, although many of the spe cialties are shown for the equipment of garages. Here is seen a Crossley Brothers' gas engine direct connected to a General Electric generator, with General Electric of China panels, motors, ventilators, etc. A Petter generating set; Osram lamps, accessories, Pax saw blades, projectors and belting of all kinds.

* * *

China Mutual Trading Company, Ltd.

STAND No. 39

THIS exhibit is confined to an all-British-made Albert car, with the following specification: 11.9 h.p., four cylinders, 68 by 103 mm. (1,496 c.c.) fully forced lubrication, leather cone clutch, four speeds, separate gear box, straight bevel back axle drive, quarter-elliptic front and canti-lever rear springing, 760 by 90 mm. tires on steel wheels, C.A.V. electric lighting and starting.

This is a car of moderate engine power which must prove adequate and efficient for all practical purposes for which a light car will be used. Interchangeability and standardized accuracy of all parts is an outstanding feature. Particular attention has been given to accessibility of all important parts. The clutch, brake and accelerator pedals are made adjustable for reach and the standard body gives ample room for the comfort of the driver. The four-speed gear box has a three point suspension, and the gear hand brake levers are centrally mounted upon it. The dickey seat is of the "sunken" type, handsomely upholstered, and comfortably accommodates two people. The aluminium body is finished in light grey, with detachable steel and black wings. Nickel fittings harmonize with the bright honnet and polished interior, has a pleasing stream-lined appearance. The Albert all-weather patent convertible body has been designed expressly for the 11.9 chassis and is constructed on the same graceful lines as the other models, completely meeting the needs of those who desire for winter motoring a body draughtproof, snug and watertight, and in summer, one which mitigates the discomfort of dusty roads.

* * *

C. E. Sparke

STAND No. 39

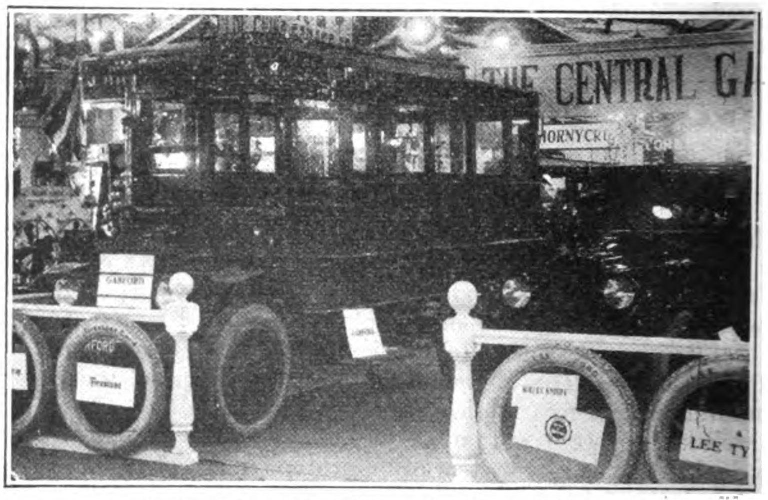
Advertising the Excess Insurance Company

MR. Sparke, as the agent of this company, says that they have settled over 1,000 motor car claims in Shanghai which is proof of the popularity and efficacy of the famous 'XS' policy.

The Central Garage

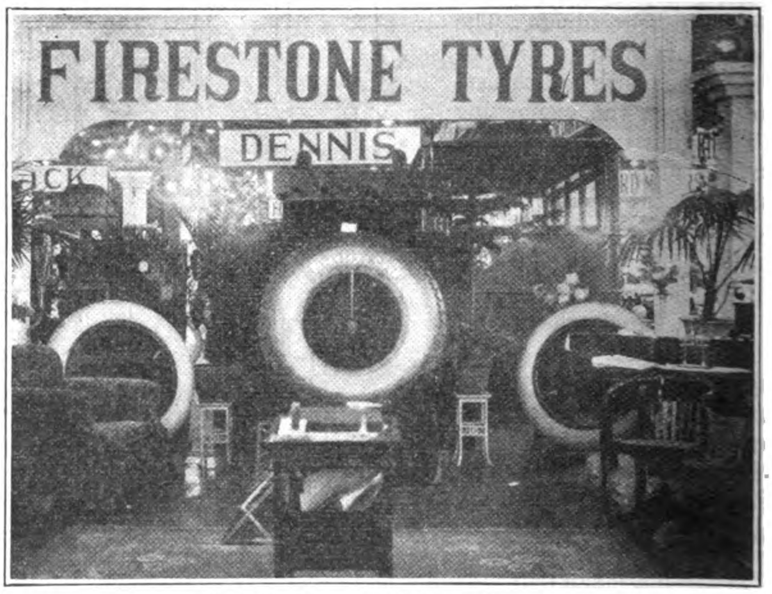
STAND Nos. 40, 41, 42, 43, 47, 48, 49, 50

IN these stands are grouped a wide assortment of British and American cars, truly international in make up. Here are Willys-Knights, Chalmers, Austin, Morris-Oxfords, Sunbeams, Templars, Armstrong-Siddeley, Overlands, Detroit Electric, Morris-Crowley, Wolseley, Angus Sanderson, A. C. Ditton Light Car, Federal, Garford and Dennis Trucks. The feature of this exhibit is a Willys-Knight chassis with exposed working engines, which attracts large crowds, and even to the uninitiated is an education on the working of a motor, not to mention the Chinese who learn for the first time something of how an engine works. The Central Garage is constantly changing its exhibits so as to display as many of their different cars as possible before the show ends.



Garford Truck Exhibit of the Central Garage

The Willys-Knight types shown are the five-seater touring car, five-seater sedan, two-seater roadster and a two-seater coupé. The Overland cars include a sedan, seven-seater touring car, two seater roadster, and a two-seater coupé. The Templar cars are a sedan, coupé and roadster. An exceptionally fine Armstrong-Siddeley, and a Detriot electric car are shown. There is also a Sunbeam, Chalmers, Morris-Oxford, and an Austin car on the floor. In addition to the cars, there is a Smith speedometer and a complete line of S. Smith & Sons, Ltd., British accessories.



Exhibited by the Central Garage

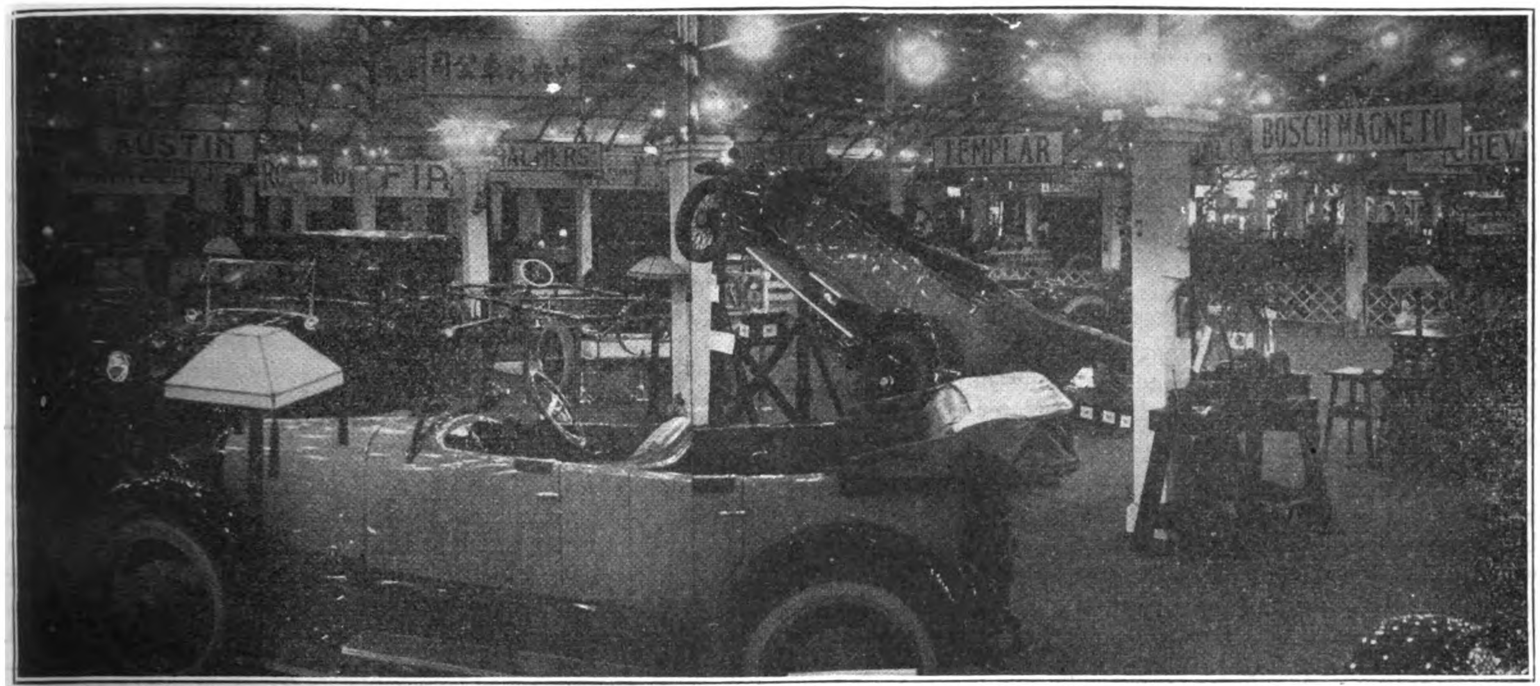
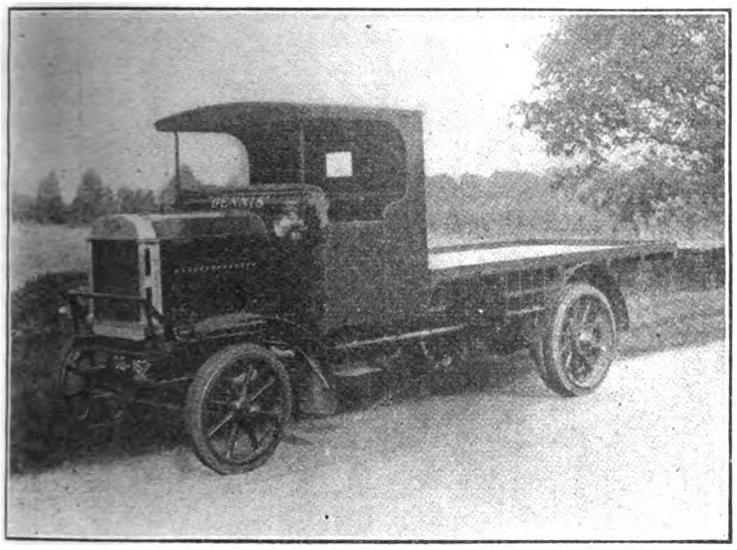
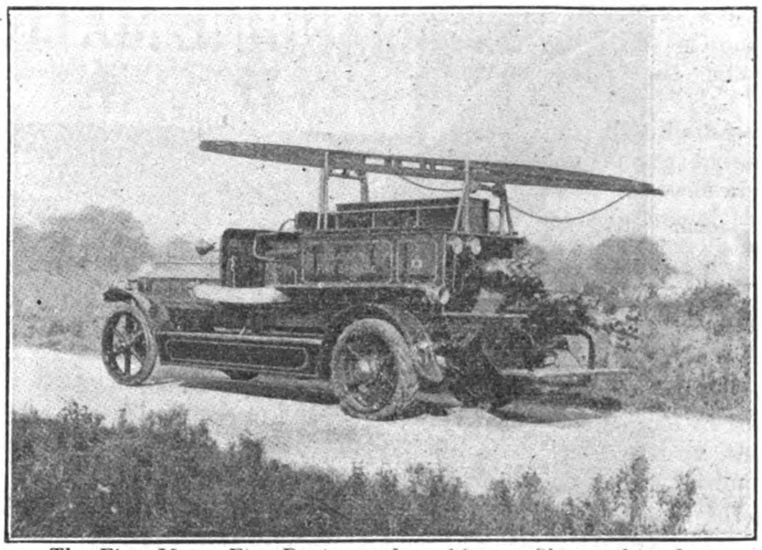


Exhibit of the Central Garage



"War Office Subsidy" Dennis 7½-ton Lorry



The First Motor Fire Engine to be sold to a Chinese Fire Dept. Several now in Operation

Exhibit of the Central Garage

One of the most interesting exhibits of the Central Garage is the famous Dennis 3-4-ton motor lorry, which was put on this market only last year when Sir Raymond Dennis passed through on his tour of investigating Oriental market conditions. Like the Thornycroft Company, the works of Dennis Brothers, Ltd., at Guildford, England, forged ahead during the war and took over their share of the great load in keeping the armies on the various fronts supplied with efficient transportation. A system of mass production was then developed and standardization of parts and models effected, which permitted rapid deliveries to the military authorities, who took over 7,000 of the 3-4-ton model alone. Special types were perfected for different work under varying climatic conditions, those for tropical countries being provided with the new "Colonial" radiator, which, by its greater cooling surface, prevents the water from overheating.

Messrs. Dennis Brothers originated the worm drive and were the first to adopt the turbine pump to motor fire engines of which they are the largest manufacturers in the world, standardizing on two models, 60 and 75 horse-power, with a capacity of 450 and 550 gallons per minute respectively. Large numbers of these machines were supplied to the British government during the war to safeguard important docks, stores and munitions factories. At the great Salonika fire two of these engines established the splendid record of operating continuously for eleven days and nine days respectively without stop. Over 200 Dennis fire engines are in use by the London fire brigade, and are installed in many of the important cities of the East, including Calcutta, Colombo, Singapore, Kuala Lumpur, Ipoh, Penang, Nanking and Tientsin. Several are in use by the Shanghai fire brigade.

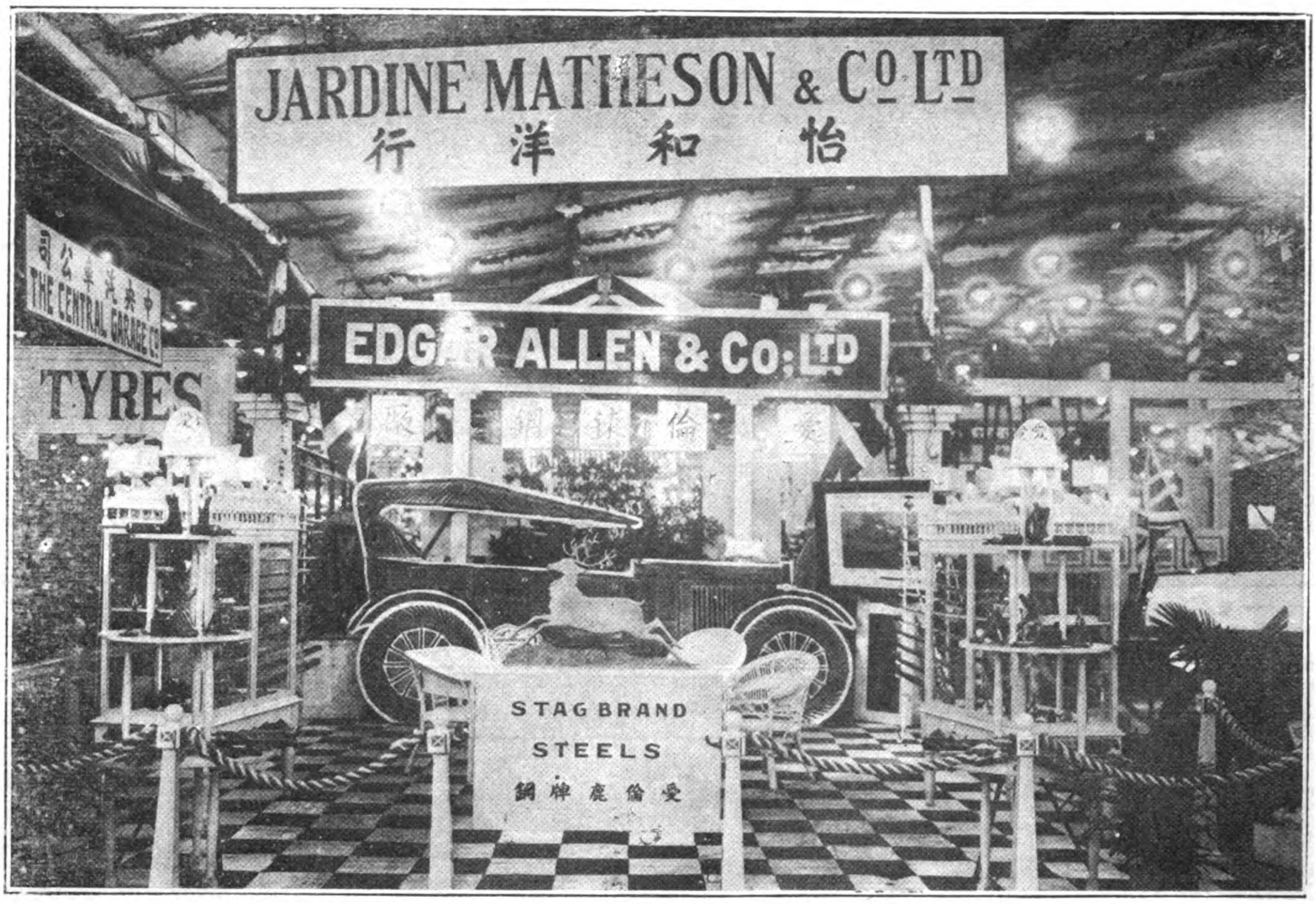
The Dennis agency in Shanghai is held by the Central Garage and with the construction of good roads and municipal improvements the company expect a large and constant demand for their splendid and efficient products. The South China agency of Dennis Brothers is held by Alexander Ross & Co., Ltd, of Hongkong.

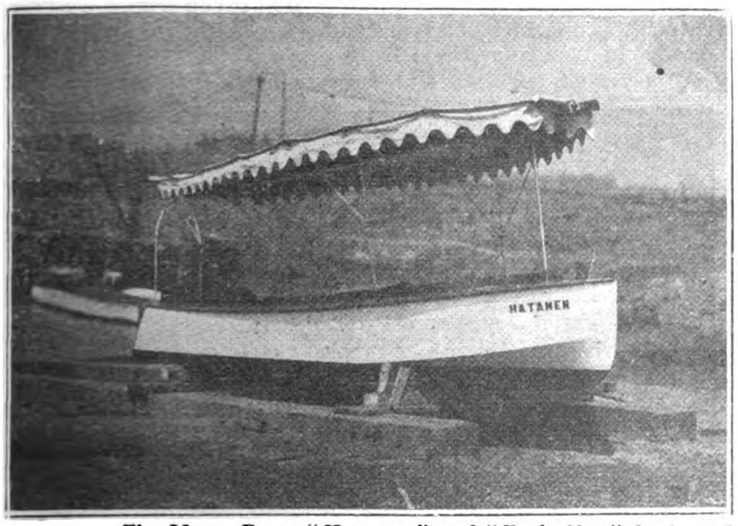
The Central Garage also displays the "Bosch" magneto.

Edgar Allen & Co., Ltd.: "Imperial" Steel Works, Sheffield

STAND No. 45

THE Edgar Allen exhibits at the Shanghai automobile show comprised some of the manufactures of the "Imperial" Steel Works steel department; namely "Stag Brand" special alloy motor car steels for the different parts of motor cars, special steel sheets for motor body work, high-speed tool steels, carbon tool steels, high-speed steel twist drills, reamers, and milling cutters, chisels, files, hammers, etc., all of which are called for and supplied to motor car manufacturers. In addition to the exhibits shown on the Edgar Allen stand, "Stag Brand" high-speed steels, twist drills and milling cutters were to be seen working on the machine tools of the working display of the Associated British Machine Tool Manufacturers. As will be seen from the illustration of the Edgar Allen exhibits "Stag Brand" cast steel files were shown to advantage in the design of a full sized motor car; among other exhibits was a large aeroplane view of the "Imperial" steel works, showing the different departments throughout the works, noticeably the steel foundry department one of the largest steel foundries in Great Britain where steel castings weighing from a few ounces to fifteen tons each are made. The railway and tramway departments wherein Edgar Allen "Imperial" patent rolled manganese steel rails, switches and crossings are made for railways and "Imperial" manganese steel points and crossings for tramways, all types of crushing and grinding machinery for mines, etc., including the manufacture of complete cement plants and colliery plants are the products of the engineering department. In addition to the manufactures of the steel department previously mentioned circular saws for cutting hot and cold steel, wood and slate, etc., also the press department for all types of steel pressings and forgings as called for by Messrs. Edgar Allen & Co.'s branch offices and agencies throughout the world.



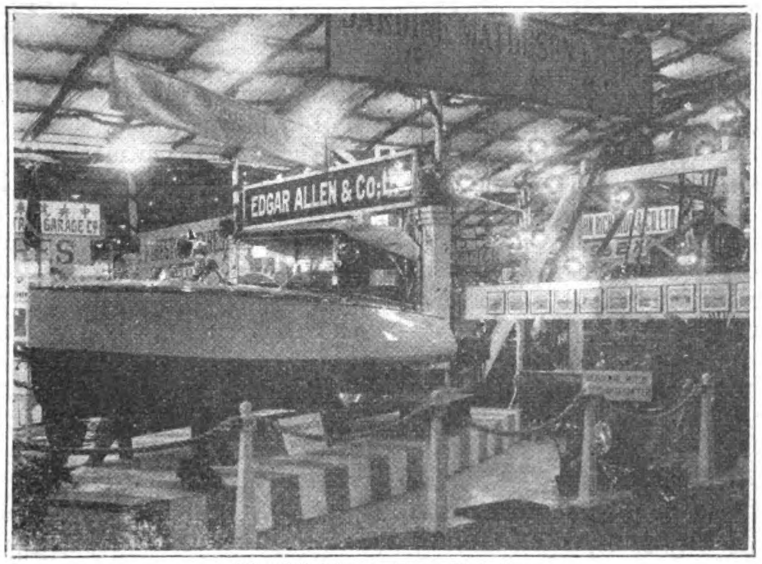


The Motor Boats "Hatamen" and "Fook Shei" built at Jardine, Matheson & Company's Motor Boat Works at Pootung

Jardine, Matheson & Company, Limited, Marine Motor Department

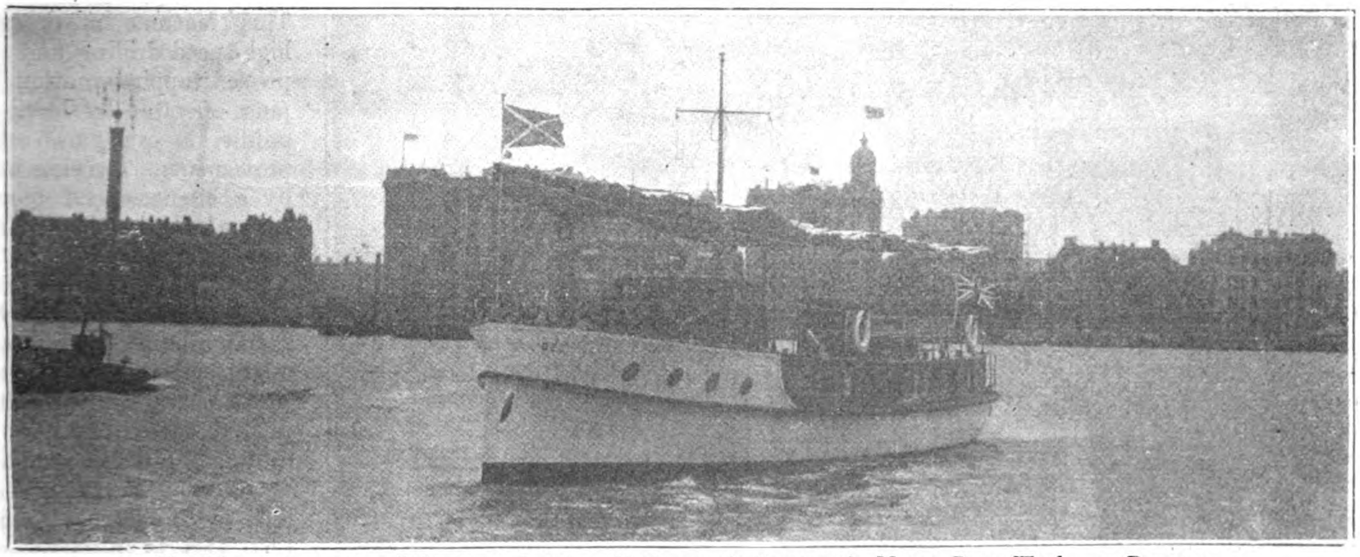
STAND No. 46

ONE of the features of the show: exhibiting a 20-foot four-seater motor boat runabout made in cedar wood and finished in white enamel with nickel-plated fittings operated by a Model "R" 50 horse-power, four-cylinder Stirling motor, guaranteed to make 20 knots or over. In addition, there is a 40-50 four-cylinder "Gleniffer" kerosene marine motor, which operates at 600-700 r.p.m. made by the well-known British motor specialists, the Gleniffer Motors, Limited of Glasgow. The model shown is a beauty, a remarkable example of finish and elegance, a high tribute to the makers. There is also a 9-12 horse-power four-cylinder "Universal" kerosene motor, from the Universal Motor Company of Oshkosh, Wis., which operates at 1,200-1,700 r.p.m. There is also a 20-30 horse-power four-cylinder "Frisbie" kerosene marine motor operating at a speed of 600-800 r.p.m. manufactured by the Frisbie Motor Company of Middletown, Ct. On the pond in the gardens is a 16-foot teakwood tender fitted with a 9-13 horse-power "Universal" motor, which has a draft of only 7 inches and a speed of 8 miles an hour consuming one gallon of kerosene per hour.



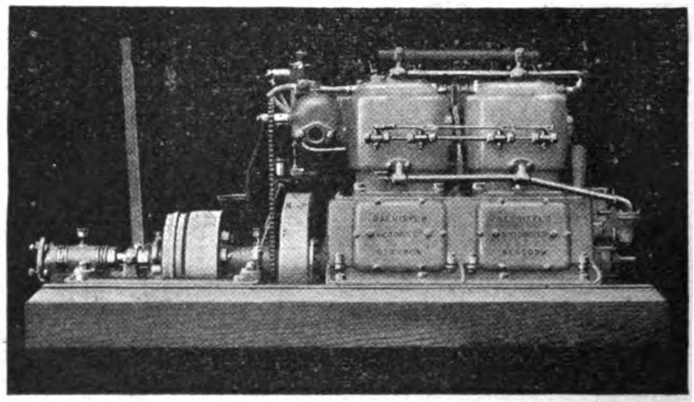
"Ewo's" Motor Boat Exhibit

Messrs. Jardine, Matheson & Company have long specialized on marine motors and motor boats, being one of the first concerns with the vision to look ahead and provide for this rapidly expanding method of transportation on China's inland rivers and lakes. Probably the most comprehensive stock of marine motors in the East is to be found in the marine motor works of Jardine, Matheson & Company, Ltd., at Pootung where motor boats of all sizes and description are constructed and overhauled. The motor yacht *Bee* herein illustrated is a splendid example of the excellent work turned out from this estab-



The Motor Boat "Bee" built at Jardine, Matheson & Company's Motor Boat Works at Pootung

lishment. The *Bee* is a steel twin-screw vessel of unusually graceful lines and beautifully fitted accommodations with a cruising speed of eleven knots. To travel by boat in any of the beautiful waterways of the Yangtze Valley shallow draft is essential and our illustration of the *Hataman*, a 16-foot light draft tender, shows a launch with a speed of about eight miles per hour on a draft of only seven inches. The engine in this interesting little craft is a 9-12 horse-power "Universal" kerosene motor with a fuel consumption of less then one gallon per hour. This launch tows an ordinary foreign houseboat at about five miles per hour and makes an ideal tender. The *Fook Shei*, also illustrated, is another product of the "Ewo" works. She is a husky towing tender with a speed of nine miles per hour. The fast run-about exhibited on Jardine's stand, was a splendid example of first-class workmanship from the Pootung motor works and the three motors represented three distinct duties: the little 9-12 h.p. four-cylinder "Universal" for small light draft vessels, the 20-30 h.p. valve-in-the-head "Frisbie" for general utility and medium-sized craft and the 40-50 "Gleniffer" for continuous hard service in heavy duty boats. The Gleniffer, it may be mentioned, is one of the best known British marine motors with a magnificent war-service. They operate with paraffin, petrol, alcohol or naptha, and for heavy work have few equals. With China's labyrinth of waterways it is certain in that given settled conditions, the future will see considerable development in the marine motor



Gleniffer Marine Motor Exhibited by "Ewo"

industry and the marine motor department of Jardine, Matheson & Company with its experienced foreign staff will certainly figure largely in this development.

Jardine, Matheson & Company, Machine Tool Display

STAND No. 53

IN addition to the exhibit of Edgar Allen & Co. and the fine show of their marine motor department, "Ewo" had also an extensive display of machine tools. Jardine, Matheson & Company are the sole agents in China for the Associated British Machine Tool Makers, Ltd., which comprises the following firms: J. Archdale & Co., Ltd., Birmingham, W. Asquith, Ltd., Halifax, J. Butler & Co., Halifax, Churchill Machine Tool Co., Manchester, Kendall & Gent, Ltd., Manchester, J. Lang & Sons, Ltd., Johnstone, J. Parkinson & Son, Shipley, G. Richards & Co., Ltd., Broadheath, Smith & Coventry, Ltd., Manchester, H. W. Ward and Co., Ltd., Birmingham.

There are seven machines actually working at the show and they reveal the best features of British workmanship.

No 1. "Universal" milling machine by Messrs. J. Parkinson & Son, Shipley. This type of machine will do accurate work, gives maximum output and is very easily handled, a special patented feature being the method of driving the feed independently of the spindle by which the capacity of removing metal is greatly increased.

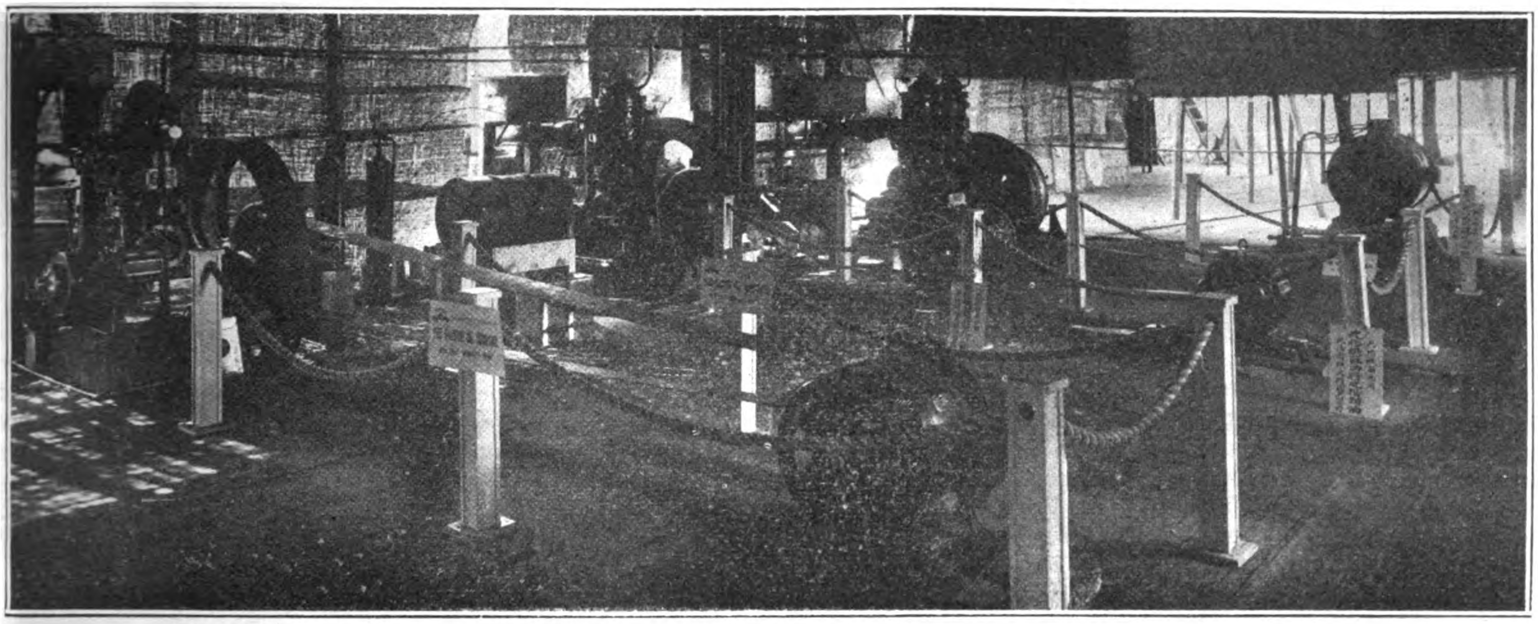
The main drive is by four-step cone and one rate of gears, thus providing eight speeds for each speed of the counter shaft, which is of compact gear-box type with two forward and one reverse speed.

No. 2. Patent sensitive and radial drilling machine by Messrs. J. Archdale & Co., Birmingham. This machine is designed for high-speed drilling and has improved tapping motion for tapping, operated by lever on the saddle, as well as other improvements. Driving motion is by a change-speed box of the sliding wheel type giving nine spindle speeds, but it can be driven by electric motor instead of the constant speed belt. The radial arm gives a radius of 32 inches, which can be extended to 38 inches and the drilling test in M. S. 3/4-in. diameter rate of drilling is 6-in. per minute.

No. 3. Radial drilling machine by Messrs. J. Archdale & Co. This is a larger machine

capable of doing larger work with a radius of 3 feet. Nine changes, and with double gearing 18 changes, of speed are provided, and in the drilling test in M. S. 1-in. diameter the rate of drilling is 6.2-in.

No. 4. 16/18-ft. stroke croak type shaping machine by Messrs. J. Butler & Co., Victoria Iron Works, Halifax. This is one of the four sizes in which these machines are manufactured.



The Electric Lighting Plant at the Auto Show

No. 5. 6-ft. by 30-in. by 30-in. high-speed planing machine by Messrs. Butler & Co. The gearing is unique in this machine. All the gears are arranged on specially prepared flanges inside the bed and no shaft bearings are cast with the bed. Once the bed is fixed on its foundation it need never be disturbed.

No. 6. 10-in. by 24-in. "Universal" grinding machine with tool and cutter equipment, by Messrs. Churchill Machine Tool Co., Manchester. In addition to the tool and cutter grinding equipment, the machine is a useful adjunct to the grinding equipment of any shop, as, if employed on plain cylindrical grinding of shafts, etc., it is just as rapid in operation as the standard "Universal" or small plain grinding machine, the table, mechanism, and speeds of these machines being identical. This latter is an important point, because when the machine is not employed for cutter or tool grinding it can always be employed for grinding shafts and similar work.

No. 7. 69X single wheel wet tool grinder by Messrs. B. R. Rowland & Co., Ltd., Reddish, near Manchester. This is manufactured in three sizes covering a long range of work, and in each case, reliability, appearance and freedom from splashing or other trouble have been studied.

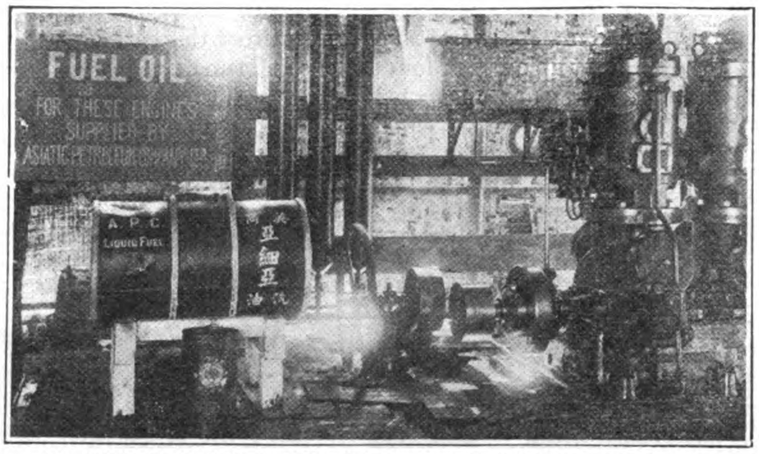
Fire Protection.—Hooked up ready to protect the highly inflammable structure against fire, were a Merryweather petrol driven and a "Valiant" steam fire engine from the well-known British manufacturers, who have been represented for many years in China by Messrs. Jardine, Matheson & Co.

Electric Lighting Plant

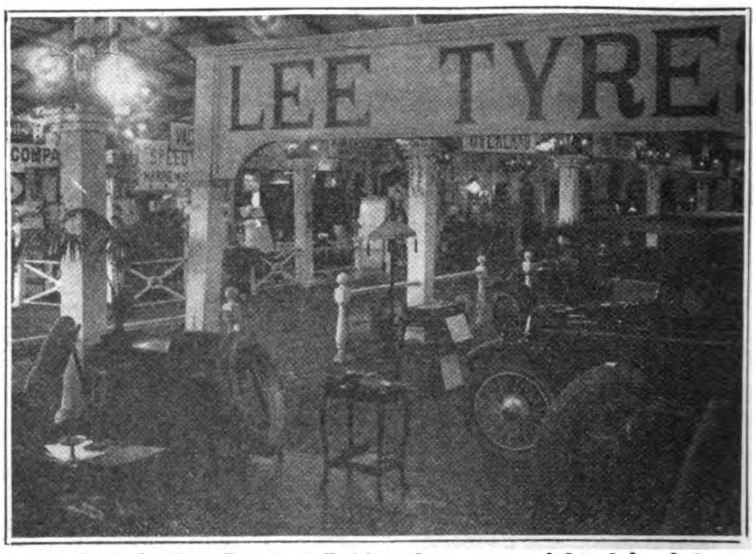
The illumination for the automobile show was supplied by the electrical department of Jardine, Matheson & Company, Ltd., from engines and plant of the different sizes carried in stock. The engines and dynamos were taken direct from the cases in which they arrived, set up on their foundations and run up to load without preliminary trial runs and continued in steady operation during the entire show without developing trouble of any kind.

The plant comprised three sets, consisting of crude oil engines of 70 h.p., 25 h.p., and 18 h.p., the generators being of 45 kw., 15 kw. and 10 kw. respectively. The engines are manufactured by Messrs. Vickers Petters of Yeovil, England, and the generators by the English Electric Co., Ltd. These engines are extremely economical in fuel consumption ranging between .45 to .55 pints of fuel oil per B.H.P. hour. The governor gear is very simple and efficient in operation and can be readily adjusted. The engines are started by means of compressed air starters, the tanks which store the air being charged direct from the engines. The fuel oil for these engines was supplied by the Asiatic Petroleum Company, Ltd.

Merryweather Fire Engines Ready to Protect the Buildings against Fire



Fuel Oil Tank Supplied by Asiatic Petroleum Company for the Electric Light Plant

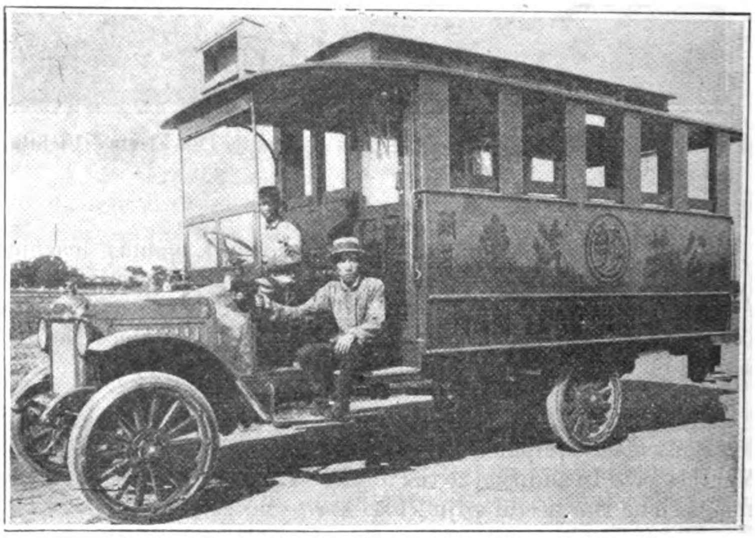


Stand of the Lee Tire and Rubber Company, exhibited by their agents, the Central Garage

John Richards & Company, Ltd.

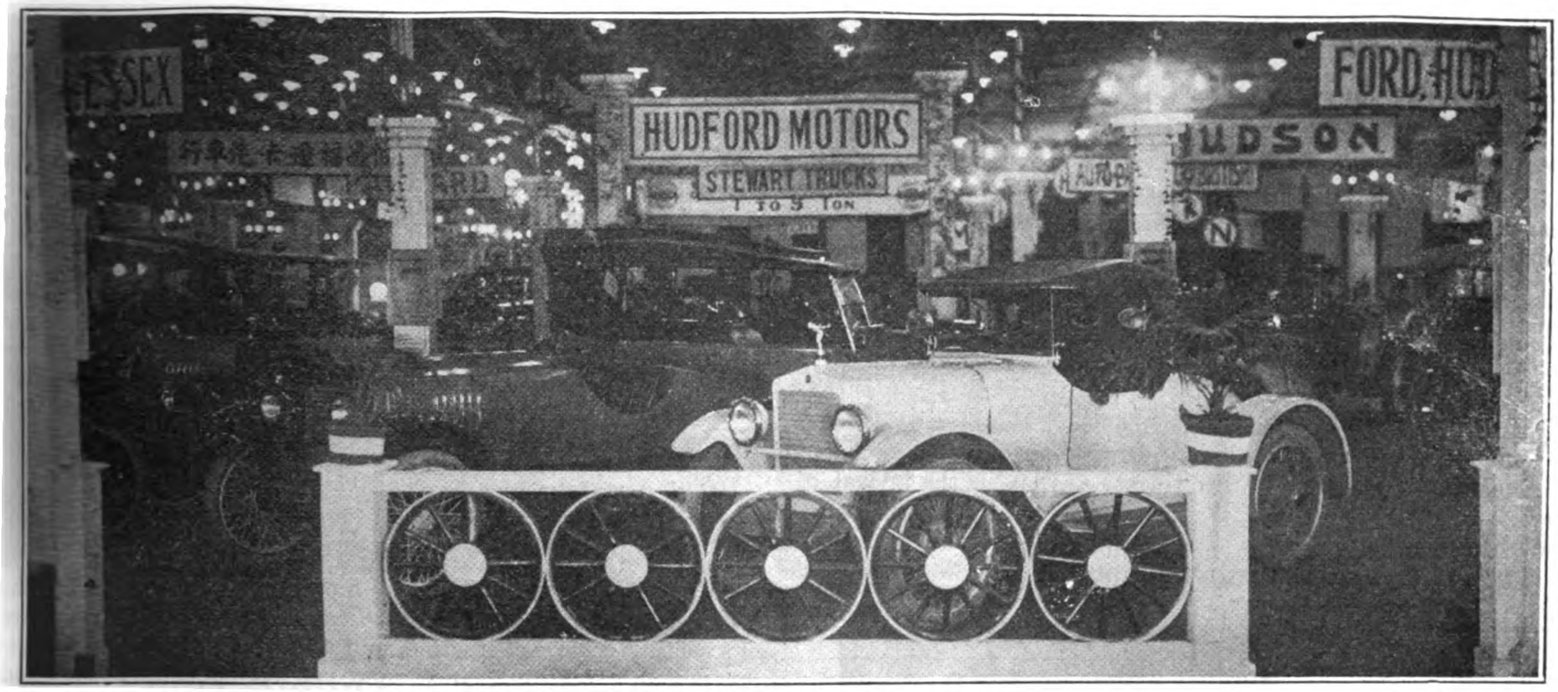
STAND No. 51

THE old and well-known Shanghai Electric and Asbestos Company, Ltd., one of the pioneers in the Chinese electrical field, went into voluntary liquidation some time ago, but many of the foremost local British interests came together to extend support and encouragement to the two directors who had contributed so much towards the opening of this market for British materials, and out of the ashes of the old concern, arose the new hong, John Richards & Company, Ltd., with Mr. Richards as managing director and Mr. J. Frost as director. With larger capital and a wider field the new organization has rapidly come to the front again as one of the strongest electrical and engineering firms in the China field, securing contracts that leave no doubt as to its ability to win success. The electrical exhibit of this concern at the auto show covered a wide range of British and some American specialties, all brilliantly illuminated by large clusters of Philips lamps, manufactured by the Philips Glowlamp Works, Ltd. There were also shown Ferranti motors of all sizes and for all purposes, switch gear from Ferguson. Päiling & Co. of Manchester, Hart accumulators, with a Thornycroft-Vickers generating set, such as have been installed in several of the Hongkong & Shanghai Bank buildings in China, Craigpark cables and wires, national gas engines made at Ashton-under-Lyne, H. T. Boothroyd, Ltd., dynamos and motors and a lift, from the Titan Lift Company, Ltd. of London, of which several have been recently installed in Shanghai. The American agencies of this concern were represented by a line of motors and fans from the Century Electric Company of St. Louis. On the whole a most excellent and comprehensive exhibit, which, taken with the activity and record of the new concern in obtaining business is evidence that the reputation of the old phœnix bird we used to read about is being pushed hard by its modern electrical and asbestos lined prototype.



Garford Motor Bus for Nantungchow furnished by the Central Garage, Shanghai

Exhibit of John Richards & Co., Ltd.



Ford, Hudson, Essex

(Dodge & Seymour (China), Limited, Exhibitors)

STAND Nos. 58-60, 65-67

FORD, Hudson and Essex cars were exhibited by the Hudford Motors, who occupied Stands 58-60, 65-67.

Dodge & Seymour made a special show of Fords in several types, from the two-seater to the limousine. A limousine chassis shipped from the Ford works and the body built by the Hudford Motors, is an exceptionally fine car, with a wheel base of 118-in. by 124-in.

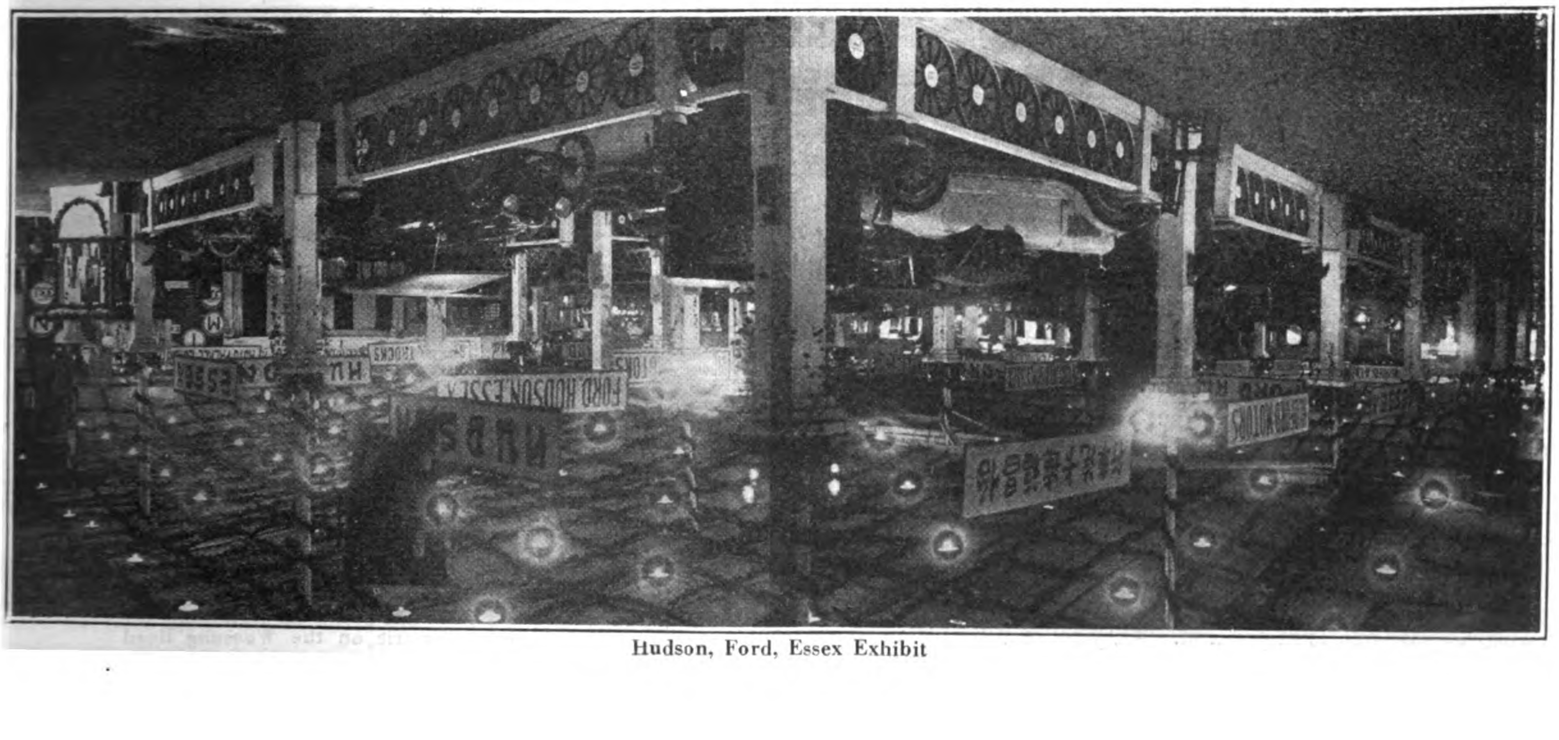
The company supply the Fords in the following types : special roadsters, limousines, landaulettes, extension roadsters and limousines, one-ton trucks, 1½ and 2-ton trucks, 2½-ton Olsen extension and Fordson tractors.

The simplicity of the Ford car, which has gained for it universal appreciation and has made it the popular car (3,500,000 people now use the Ford car), is well-known and the models exhibited by the Hudford people are worth examination.

The steel used in Ford cars is treated with vanadium and other mineral alloys, which not only cleanses the molten steel of impurities, but brings the molecules closer together, giving them greater adhesiveness and making the resulting product infinitely tougher and stronger. The steel so treated is the highest priced as well as the highest quality used in automobile construction. At the expense of several hundred thousands of dollars and a great deal of valuable time Mr. Ford worked up the formulas by which the steel is produced and heat-treated.

HUDSON AND ESSEX.—The Hudson and Essex cars were a big part of the Hudford motors show stocked in the following types : Roadsters, limousines, broughams and touring cars, the first three having special bodies.

The Hudson limousine in beauty and finish is comparable to the most costly cars on the market. Yet, mounted upon a chassis which is built in large quantities, it can be produced at a surprisingly moderate cost as compared with many cars of its type. The bodies are built with painstaking care, and in limited numbers. No detail of equipment is lacking—vanity case, smoking set, foot rest, pillows, clock, even to the silver and ivory mounting of the door latches. The excess power of the Hudson super-six motor adapts itself admirably to the larger limousine type of body, and



Hudson, Ford, Essex Exhibit

gives, without added weight, the quick acceleration so desirable in heavy and congested city traffic, together with the smooth steady power so pleasing on the open boulevard.

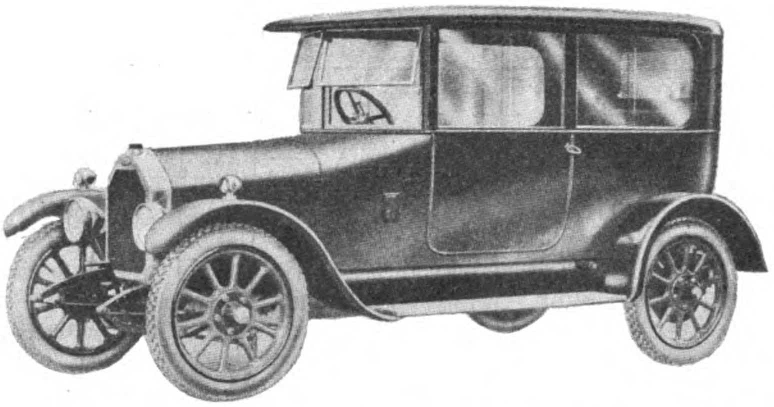
The touring offers style, comfort, beauty of line and finish and above all, performance.

In the Essex cars the five-passenger touring car is a model, beautiful in line and finish. The seats are wide and roomy. Sturdy construction assures great riding comfort and small depreciation.

* * *

The Humber Car

REPRESENTED in China by Messrs. Scott, Harding & Company of Shanghai, this well-known British car was not exhibited at the automobile show, owing to a delay in the arrival of new cars. These handsome cars are, however, a feature of Shanghai's roads and are owned by many of the most prominent taipans. The new 1922 Humber's attracted great attention at the recent



Olympia show at London where the following models at reduced prices were shown:—

11.4-h.p. 2-seater (with double dickey seat), £595: 11.4-h.p. 4-seater touring car, £620: 11.4-h.p. coupé (with double dickey seat), £725: 15.9-h.p. 5-seater touring car, £850: 15.9-h.p. saloon de luxe, £1,200.

The lively interest created by the Humber exhibit at Olympia last year and the enthusiastic expressions by the best judges on that occasion have been fully justified by the firm's experience during 1921. The 11.4 h.p. and the 15.9 h.p. models have more than maintained the high reputation of Humber productions. Indeed, Messrs. Humber, Limited, have been hard at it throughout the entire season to cope with the enormous demand. An inspection of the 1922 models will first of all reveal, side-by-side with price reductions, the introduction of several features of exceptional interest in bodywork and some notable refinements in chassis details. A new all-weather hood, standardised on the 2-seater, 4-seater, and 5-seater open cars, will prove a great boon to every class of motorist.

THE ALL-WEATHER FEATURE.—By means of this exclusive feature the open models can be easily and quickly converted into all-weather vehicles. When the hood is erected complete with the side panels, etc., it is taut and tidy looking, and there is nothing to detract from the general harmony of outline. The side panels are fitted with non-inflammable celluloid lights supported by aluminium frames concealed by the fabric covering. The light in the rear of the hood is also made from this special non-inflammable celluloid. When the panels are fitted into position they lie snugly against the inner fabric fillet, thereby effecting an absolutely weather-proof joint. They are rigid in use, and those fitted to the doors are provided with a flat metal arm, which slides into a socket in the door, the front panels being additionally secured to the wind-screen upright. All doors open easily and to their full extent, with the side panels in position. They serve a double purpose for their stiff construction renders them ideal for use as side screens when the hood is down.

THE 11.4-H.P. MODELS.—The three 11.4-h.p. cars exhibited were delightfully designed and all that can be desired in their particular class. The ease with which they are handled, the obvious strength and perfect springing of the chassis, power on hills, easy gear change and quiet running, make the Humber 11.4-h.p.'s most remarkable models in every sense of the word.

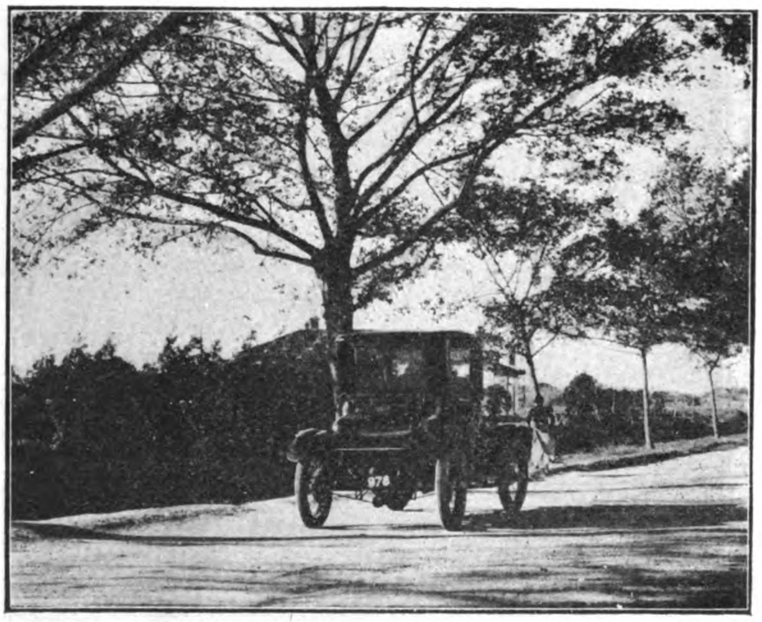
The 2-seater open model and coupé possess well upholstered double dickey seats with folding arm-rests, all enclosed in their spacious boots. The cars are richly upholstered with real horse hair stuffing and coppered springs. The covering for the 2 and 4-seater open models being first selection hand buffed leather, and for the enclosed models, rich Bedford cord.

THE 11.4-H.P. SALOON.—The 11.4-h.p. saloon, priced at £750, is a remarkable value and its graceful lines, beauty of finish and luxury of equipment fully reflect the Humber tradition.

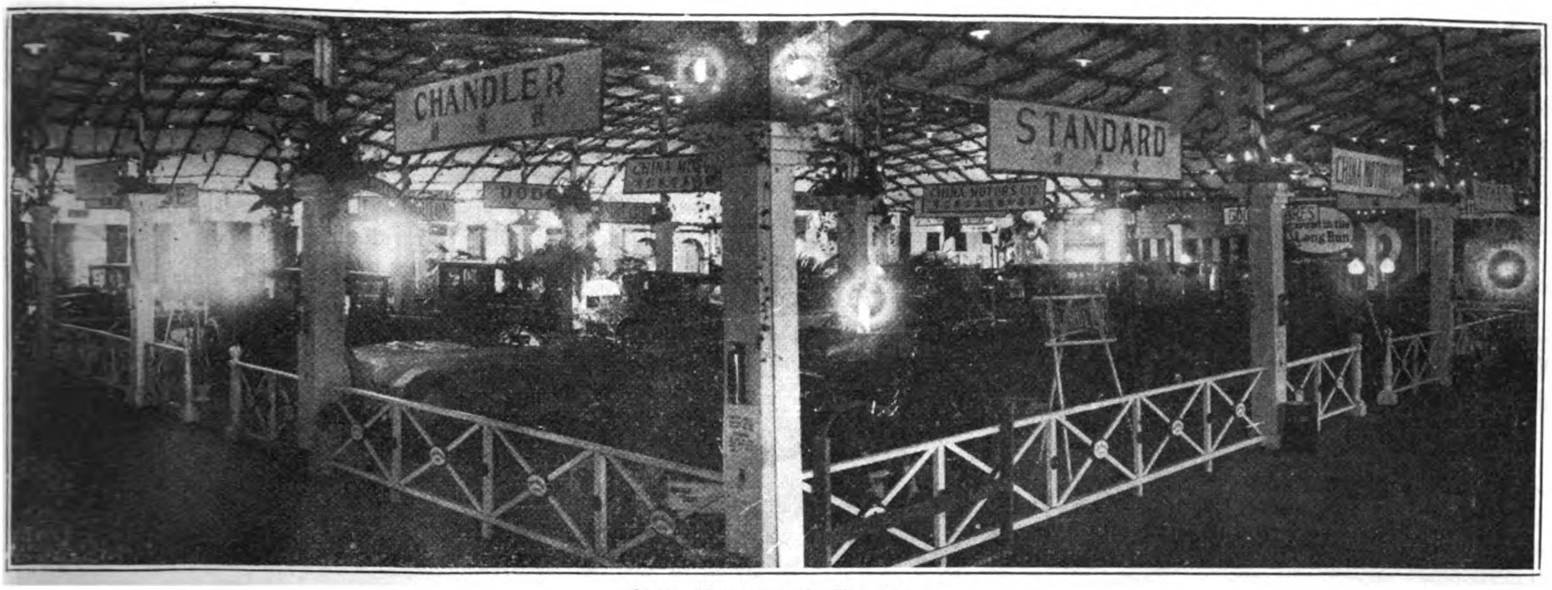
15.9-H.P. MODELS.—The 15.9-h.p. five-seated tourer and the saloon de luxe are the accumulated experience of nearly a quarter of a century of car construction, and the net result is a car of faultless design, exquisite balance, solid yet flexible construction, and refined finish. The over-all lines and general appearance of the open five-seater are as elegant as those of any car of its class on the road; its silence is one of its great assets, simplicity of control is a very strong feature, and for these and other equally sound reasons this model has been repeatedly described as the ideal car for the owner-driver.

THE SALOON DE LUXE.—This is the Humber model superb, illustrating as it does car refinement and comfort in the highest degree. It is luxuriously appointed and accommodates four passengers with every traveling facility; upholstered throughout in rich Bedford cord, and beautifully sprung. The driver's seat is of the bucket-type, detachable, and is adjustable fore and aft. The front passenger seat is of a specially designed detachable and collapsible type, folding up neatly to the side of the body, allowing free access to the driver's seat. The rear seat is exceptionally cosy, and accommodates two passengers with room to spare.

All that can be done by years of scientific study, aided by skilled craftsmanship and the use of the best materials, has been done to make the Humber cars of 1922 the most perfect examples of modern car construction. Alike in appearance, economy of fuel, and low cost of upkeep these models may be relied upon to further enhance the Humber reputation.



A Milburn Electric on the Woosung Road



China Motors, Ltd., Exhibit

China Motors, Limited

STAND Nos. 68-76

THIS concern had a most diversified and exceptionally well displayed exhibit of the many well-known machines they are agents for in China. Over a dozen manufacturers of standard automobiles have entrusted their interests to the China Motors, Ltd., foremost amongst which are the Hupmobile, Dodge, Chandler, Premier, Cleveland and Leyland, American, and the Standard, Lancaster, Crossley and Clyesdale of England, the A.B.C. and Indian motor cycles. This company has come to the front as one of the most successful in the Far East. It operates two of the largest garages in Shanghai, the Central and Eastern, and recently purchased a site on the Bubbling Well Road with a 450-foot frontage upon which will be erected the largest garage in Asia.

The new building will house all of the Company's manufacturing activities and the ten odd different makes of cars for which it is agents with a complete shop for motor and aeroplane engine repairs. The coach building floor will be one of the largest and most up-to-date in the world. Branches in North China have been opened, with a fine establishment in Peking as the Company's main subsidiary. The Star Garage of this concern is four storeys in height with a floor space of 55,000 feet and a depth of 290 feet and a frontage on Bubbling Well Road of 75 feet.

In addition to the show rooms the first floor is occupied by the body construction department which turns out coachwork equal to western plants. The forge rooms, battery charging plant and the lathe rooms are also well equipped.

Machinery for the making of spare parts have been installed in these shops. Painting and varnishing is done on the second floor and have dust proof heated rooms connected with the body building department by two large elevators.

The tire repair department with a modern steam vulcanizing plant is on the third floor.

The features of the various machines exhibited by the China Motors, Ltd., are given by them as follows:

Hupmobile.—This is the most efficient four cylinder car produced by America giving a splendid performance for such an economical engine being capable of 60 m.p.h. The general design of the Hupmobile embodies the essentials of permanent style and beauty. The same scrupulous care and skilful workmanship that has earned such a remarkable reputation for the Hupmobile engine, provide a body roomy and comfortable, with equipment and appointments of the same high quality as the car itself.

Dodge.—The Dodge is only produced in one model and has been tried out over the world for years past and has stood up to the most trying condition in a very satisfactory manner. A brief examination of the chassis reveals several instances showing how the comfort of the driver and the ease with which the latter can affect adjustments have been considered. A minor point, but none the less important, is the location of the pedals for the clutch, accelerator and brake. Michelin disc wheels are used as standard equipment. Competent performance, unusual petrol and tire mileage and marked freedom from repair are a characteristic of this car.

Cleveland.—This car is produced at the Chandler factory and embodies all the fine qualities of that wonderful car on a lighter and smaller scale. In its lines of design, in the nicety of all its fittings and furnishings, and in the beauty of its finish, it reflects the ideals which created it, and which are built into it.

Chandler.—The Chandler six motor is a very marvelous engine and the general construction of this car puts it in a class entirely in its own and is doubtless the best car produced, at its price, in America. Special features that have made the Chandler motor famous include the solid one-piece aluminium motor base, extending solidly from frame to frame; the silent chain drive for the auxiliary motor shafts, three chains running in a constant spray of oil, and the Bosch high-tension magneto for positive ignition.

Standard.—The economy with which this small car can be run makes it very attractive to the man that requires utility with economy. The patented top and side curtains convert the car from a touring car to an all weather car in a few moments, and the adoption of an overhead valve engine, flexible joints in the trans-

China Motors, Ltd., Exhibit

mission, and additional oil spaces for the rear axle all tend to the efficiency of this car.

Crossley.—This car is so well known from its services rendered to the R.F.C. during the recent war that comment is superfluous.

Leyland Truck.—This chassis is too well known the world over to require any description. Its the acme of first quality English production.

Indian Motor Cycle.—These motor cycles have become a byeword in the world of sporting and hard riding motor cyclists. With frame specially designed and built to withstand the shocks and jars inseparable from travel over all kinds of roads, with steels of the highest quality entering into its construction, long life and faithful operation are assured. The maximum of economy is obtained by this engine, between 40 to 46 miles on a gallon of petrol and from 80 to 100 miles on a quart of lubricating oil is not unusual.

A.B.C. Motor Cycle.—This motor cycle is an entirely new departure. The four speed gear box gives the rider a feeling of security quite impossible to a rider of earlier motor cycles and the efficiency of the A.B.C. is maintained irrespective of climate conditions. An aircraft motor in miniature with its steel cylinders and symmetrical head design, the engine will never over heat. It can be run indefinitely on the low gears without suffering the least harm.

The H. S. Honigsberg & Co., Inc., Exhibit

H. S. Honigsberg & Company

STAND Nos. 54-64

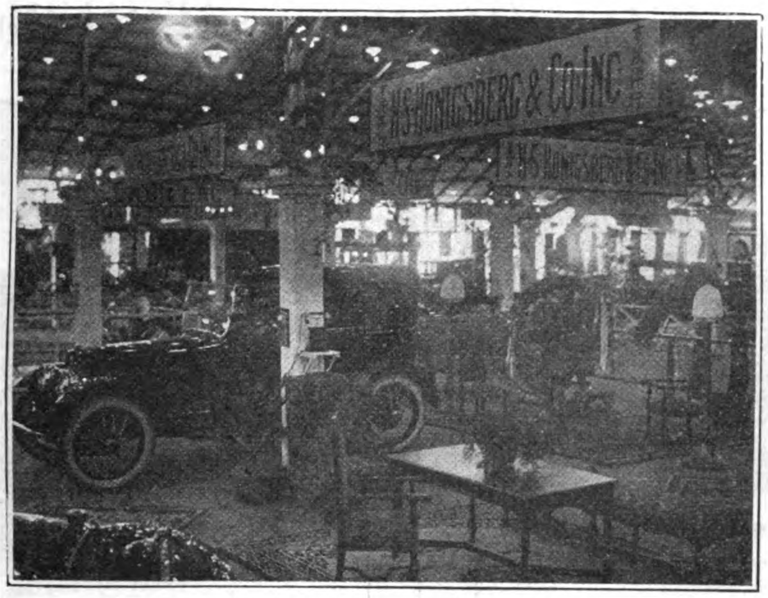
LAST on the list of stalls but first in the size and excellence of exhibit is H. S. Honigsberg & Company, Inc., the pioneer American motor agency in China. American automotive manufacturers are indebted to the head of this enterprising concern for many of the advantages they now enjoy in this market, the result of the untiring activity on the part of the young Californian who had the vision to foresee and the sticktoitiveness to win success. From a local market limited to the sale of a few pleasure cars, the field had broadened year by year as new roads have opened up new territory. Many new concerns and agencies have entered the field, with American, British, French, German and other manufacturers keenly competing for the business, but it is fair to say that they all concede a generous word of praise to the enterprising young American who contributed so largely to paving the way for the creation of the present-day market in China. The early missionary work of this concern has been cumulative. All have benefited. Its business has kept pace with the expansion of the market, being incorporated and strengthened with a large working capital which enables it to swing successfully its increasing volume of orders.

It is needless to remark that much of the success of the automobile show is also due to the hearty co-operation and sound practical ideas of Mr. Honigsberg, who early saw the importance of such an exhibition as a means of promoting greater interest in mechanical transportation throughout China, and gave his time to its organization as head of the house committee which had charge of the exhibits. The Honigsberg stands in the show were the first to have their signs out. It is difficult in such a short article to review the many activities of this firm or adequately describe their exhibits. Suffice to say that prominence was given to their three leaders, the Buick, Chevrolet and Cadillac motors, which were displayed in various types. The features of these machines as given out by Messrs. Honigsberg & Company are as follows:

Buick Four.—The 20 h.p. model, which closely resembles the famous six-cylinder car, follow generally a design which may possibly be described from the British point of view, as more orthodox than most American designs. The engine is in appearance similar to the six cylinder Buick: manifolds and carburetor are mounted on the left side and a new type of heat control for the carburetor is used. This heat control consists of two pipes extending from the exhaust pipe in front to a heating chamber around the base of the intake manifolds. A valve is placed in the exhaust pipe at the left of the upper tube. This valve is operated automatically from the throttle valve so that at low speeds all the exhaust gases are passed around the intake manifold and at high speeds practically none of the exhaust gases pass around the manifold. This new device appears to be a great improvement, and no

doubt it is in some measure responsible for the excellent performance being secured from this engine, on test and experimental cars.

Cadillac.—The chassis of the 32 h.p. car is interesting because the Cadillac claims to be the original eight-cylinder car (at all events so far as America is concerned) there being several features embodied in the design which render it particularly attractive thermostatically controlled radiator, to mention but one. The body has the appearance of permanence of style, which would protect the owner's ability to use his car with propriety just so long as the chassis renders him efficient service. Qualities of safety, long life, comfort and roadability are combined with a body whose horizontal lines and exterior curves are significant of its ability to travel fast.



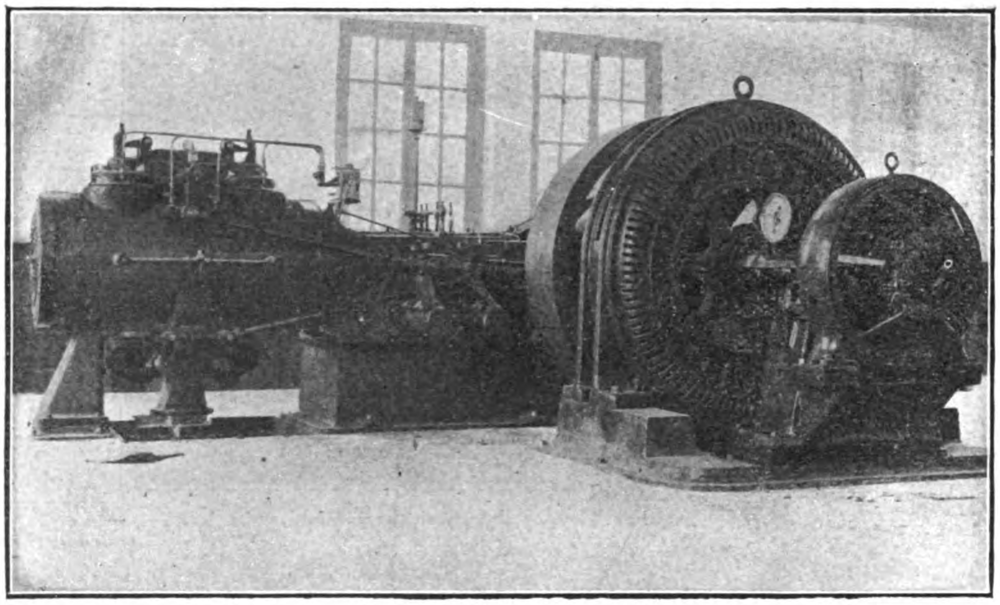
Another View of the Honigsberg Stand

Chevrolet.—It is sometimes hard to describe a famous car as it is a famous man. There are so many good points, that it is usually difficult to decide where to start to describe all the good points they possess. At all events the Chevrolet valve-in-head engine does not waste any petrol, and the valves are fitted and operated by push rods, and the cylinder head is detachable. A somewhat unusual arrangement is adopted for the brake, the clutch pedal, when fully depressed, acting on the external brake of the rear wheels, while the internal brake is operated by the orthodox pedal worked by the right foot. This pedal, however, has a tilting head, so that the brake may be locked hard on when required. A tie rod beneath the rear axle would appear to render the easy jacking up of the car a matter of little difficulty.

Two Views of the Honigsberg Exhibit

NORTHWEST MOTOR COMPANY

The Northwest Motor Company of Suiyuan has built a road from Suiyuan to Paotowchen on the Yellow River, a distance of 96 miles. The road itself, across a level stretch of country, required little more than ditching and placing culverts, and cost less than $20,000. The company operates four Denby trucks and eighteen cars with local-made bodies on Dodge chassis, seating nine persons. The average running time under favorable conditions is six hours. This company is just keeping ahead of the railway and may be expected to strike out further towards Ninghsia as the rail head arrives at the Yellow River. The company has been eminently successful under the direction of Mr. Ni, who also heads the Suiyuan chamber of commerce. It was capitalized at $200,000 and a large portion of the shares subscribed to by the tuchun, General Tsai Cheng-hsuan, later minister of war at Peking. Road building in this section of China is the cheapest part of the expense attached to the extension of motor traffic, new construction costing about the same as upkeep. In fact, roads are as such, are hardly necessary except in certain well-defined localities.



Skinner Universal Unaflow Engine with International General Electric Company Generator and Direct-Connected Exciter

Installations of a character similar to the one illustrated above have been made by us in many cities and industrial establishments in China for the purpose of furnishing electric light and power.

With a staff of experienced specialists in every branch of engineering effort, we are prepared to handle any engineering project from the point of preliminary survey, through all the detail of des'gn and estimate, up to turning over to the client the completed installation ready for operation.

ANDERSEN, MEYER & CO., LTD.

SHANGHAI

CANTON	HONGKONG	PEKING
FOOCHOW	KALGAN	TIENTSIN
HANKOW	MUKDEN	TSINAN

Harbin and Vladivostok Representatives: AMERICAN COMMERCIAL & INDUSTRIAL CO., LTD.

Far Eastern Automotive Bulletin

NEW ROADS, etc.

AVIATION

Chinese Hydroplane Tests.—Further successful experimental test flights have been made on the Min River, with Chinese constructed hydro-aeroplanes. The machines were operated by Mr. Hockey —a British pilot. Recent flights appear to be of considerable duration, and it is understood that very good altitudes have been obtained. According to the pilot, the hydro-aeroplanes are well constructed, reliable and economical.

Why Chang Tso-lin Needs Aeroplanes.—Chang Tso-lin had twenty Peking government's airplanes up until a short time ago but they have all been smashed and the pilots killed in accidents. It is barely possible that the Peking government would give him some of the new planes if an aviation pilot or instructor could be found who would be willing to go to Mukden. But as the available airmen are necessarily young and still love life they prefer to remain at Nanyuan where, at least, they have the satisfaction of knowing that their planes are looked after by competent mechanicians before flights.—*P.D.N.*

Chihli Air Service.—Following the lead of General Chang Tso-lin, who recently suggested and carried through the formation of a Fengtien branch of the Chinese air force, General Tsao Kun asks the central government to create another branch for Chihli, Shantung and Honan. As chief of this branch Colonel Chin Kou-yuan has been nominated.

No Air Funds, P. I.—There is no appropriation made for the air service of the militia in the 1922 budget, according to information obtained at the Ayuntamiento.

Australia Air Services.—The federal government has decided to utilize the country's aircraft for long distance postal service and a limited passenger service. The routes include Adelaide to Sydney, 750 miles, and Sydney to Brisbane, 575 miles. The subsidy now arranged is L175,000 for the first year and L115,000 for the second year.

Hydroplanes for Canton.—Peking has received news that an engineering yard at Nantao is making hydroplanes for the Canton government. Orders have been given to the local authorities to investigate and report. The Chinese press finishes up the report by saying that the machine come from abroad and four are now being fitted up.

Two New Air Lines in China.—The aeronautical department, Peking, is planning an air line from Cheng-chow, Honan, to Shensi, and at request of General Tsao-Kun is also considering the Peking-Hankow line. However, in view of the emptiness of the treasury, these schemes may not materialize.

Aerial School in Dairen.—Mr. S. Kagawa, adviser to the aeronautic school at Mizuta, is on his way to Dairen with a view to establishing an aerial school in Manchuria. He stated at an interview prior to his departure that if he succeeds in getting a suitable tract of land in Dairen, he will remove the aerial school at Ojima in Gumma prefecture.

Air Department at Mukden.—General Pan Chu-ying, chief of the air department, is in Mukden to interview General Chang Tso-lin regarding the branch of the air department which has been inaugurated by General Chang at Mukden.

Aeroplane Transportation Company.—The Chinese consul-ganeral at San Francisco has received a petition from over twenty Chinese merchants at that place asking permission for organizing an aerial company in Chekiang, with a capital of $500,000. The consul-general has taken the matter up with the ministry of agriculture and commerce and aeronautical department, Peking.

Peking-Shensi Air Line.—While the construction of Peking-Lanchow aerial line is proceeding under the direction of the aeronautical department, the government (at the request of the Tuchun of Shensi) is preparing another air line from Peking to Shensi. An attempt is being made to raise a fund for the enterprise.

Chang Commandeers Planes.—Marshal Chang Tso-lin recently demanded that ten of the new planes received by Peking be sent to him at Mukden. In support of his demand Chang stated that he understood that a shipment of over one hundred aeroplanes had just been delivered at Peking by Messrs. Vickers and therefore the allotments to Mukden of a moderate 10 per cent. was very reasonable. The provision set forth in the Vickers loan agreement that the aeroplanes should be used only for commercial purposes was a reminder to Peking that should the aeroplanes be disposed of for military purposes in such a way the British minister would lodge a protest. Chang Tso-lin insisted that the aeronautical department in Mukden, which had been established with the permission of the Peking government, was just as important as that at Peking, and was entitled to a portion of the new aeroplanes. The despatch of aeroplanes to Mukden, he added, could not be regarded as a precedent, because there were no authorized aeronautical departments in other provinces.

The result is that several aeroplanes will be sent to Mukden under the pretext that they are temporarily loaned to the Mukden aeronautical department.

AUTOMOTIVE, ROADS, ETC.

New Maloo, Canton,—The construction of the southern extension of the Yuek Shau Maloo has been completed.

The extension is 6,000 feet in length, connecting the Ta Sha Tau station of the Canton-Kowloon Railway and the northern section of the Yuek Shau Maloo.

To Build Autos?—There is a proposal that the many shipyards in Osaka which cannot find employment now should take up the manufacture of motor-cars. Assuming that the technical difficulties can be overcome, there is an important point still to consider—the increased duty on steel and things made of steel. The shipbuilding yards supported this imposition on the strength of a promise to exempt shipbuilding steel.

Ningpo-Szechee-Chinghai Auto-Bus.—The Ningpo-Szechee-Chinghai Automobile Transportation Co., with mutual communications societies, has made considerable headway and at a meeting of promoters recently held at Shanghai it was decided that surveying should start on December 6, 1921, and that notifications to that effect be issued at the places concerned

Chekiang-Kiangsu Roads.—In an endeavor to complete the main highway from Shanghai to Hangchow and from Shanghai to Nanking, the national road construction association is steadily going on with its works under the chairmanship of Dr. C. T. Wang. In an interview with the tuchun of Chekiang, Dr. Wang promised that the Chekiang military surveying department would take care of the survey of the highway from Shanghai to Hangchow. It is understood that Dr. Wang has made a similar petition to the military governor of Kiangsu, asking him to follow the example of Chekiang by having the Shanghai-Nanking highway surveyed so as to accelerate the completion of these most important roads.

New Road, Nanking.—The Tong-shan modern road at Nanking has been completed and auto bus service on the line has been inaugurated by the Shun Nih Co. with two automobiles.

Chinese Post Office Buying Trucks.—The metropolitan post office at Peking has ordered from a certain French firm more trucks for facilitating delivery of mail.

Auto Bus Service, Anhwei.—Mr. Sze Fong-yee has proposed the organization of an automobile transportation company to operate a service from Anking to Yin-chow by appropriating an amount which was originally raised for building the An-Tze Railway. Road will be built as soon as the capital for the company is secured.

Auto Bus Services, Fengtien.—The petition made by Mr. Yue Chiar-feng for operating an auto bus service between Antung and Dah-ku-shan, Fengtien, is said to have received favorable consideration of the authorities concerned. It is also reported that Mr. Yue has applied to the local officials for running another automobile transportation service in Fengtien, from Antung to Ling-kiang. A special feature of the new enterprise is that auto buses will run over ice between the two points.

Chefoo-Weihsien Road.—The Chefoo-Weihsien road constructed under the auspices of Chiao-tungpu is approaching completion and the ministry intends to offer the completed section, about 500 li in length, to the public for running auto bus services thereon with an annual charge of road-repairing fee to be paid to the government. Any Chinese interested may apply to the ministry of communications for the undertaking but as the road lies in Shantung, citizens of that province shall have the preference.

New Auto Bus Co.—The Shanghai-Chuensha Automobile Transportation Co. now being organized at Pootung by Mr. Chu Shih-hsuen has been registered with the ministry of communications and agriculture and commerce.

Chekiang-Kiangsi Automobile Road.—The plan for operating an automobile transportation service from Chekiang to Kiangsi formulated by Mr. Chen Hsu-dong, ex-chief of embankment works department of Haining, Chekiang, has received the approval of the provincial authorities of Chekiang, and subscriptions to the capital of the new company have been invited.

Chefoo-Weihsien Branch Motor Road.—Mr. Chai Fan-teh, chief engineer of the Chefoo-Weihsien automobile road, has received instructions from the ministry of communications to the effect that a branch road from Pien-ping-hsien to Wai-hai, Shantung, will be built. The construction of the road will probably be carried out next spring.

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Construction Work of Pootung Automobile Roads.—After two months of work on the Shanghai-Nanwei automobile road, the section from Chow-chair-doo to San-ling-dong has been completed and it is generally believed that at the end of the year the road will reach Chow-poo. Work on the two cement bridges known as Hung-dah-jao and Sun-chiar-jao has been started. It is expected that service between Chow-chiar-doo and San-ling dong will be inaugurated within the year, while through traffic on the whole line will be possible by the end of April, 1922.

With regard to another automobile road in Pootung, from Shanghai to Chuen-sha, great progress is also being made in construction work. The capital of the Company has been fully subscribed and surveying from Ching-ning-sze to Yee-chiar-jao completed. Work on two large cement bridges named Mar-chair-pang-jao and Dao-kiu-jao, will soon commence and are expected to be finished next March. The road will have a width of 40 feet except at the most prosperous section from Ching-ning-sze to King-chiar-jao where it will be 50 feet wide.

Shanghai-Taichong Automobile Transportation Co. Ready to Oporate.—The construction of the motor road from Chapei to Lu-tien, about 30 *li* in distance, has been concluded by the Shanghai-Taichong Automobile Transportation Co., and an auto bus service will be inaugurated on January 1st, 1922, with five new buses each capable of accommodating 10 passengers in the first class and 16 in the second class compartment. These cars, of American manufacture, cost about Tls. 4,500 each. A trial service of the new buses will be made shortly, making a round trip to Woosung, passing through Yangtszepoo and military roads.

In addition to the auto buses, the Company will purchase several motor cars for general service.

Soochow-Kashing-Huchow Automobile Transportation Co.—With reference to the Soochow-Kashing-Huchow Automobile Transportation Co. proposed by Mr. Chen Wei-yu with a capital of $3,000,000, it is learned that the following five roads will be built :

(1) Starting from Soochow, running eastward via Kwan-shan and Tai-chong to connect with the Shanghai-Taichong automobile road leading direct to Shanghai.

(2) From Soochow to Kashing via Huchow.

(3) From Huchow to Kwang-teh leading to the Anhwai provincial road.

(4) Starting from Soochow, passing through Chang-zao and Fu-shan-ching leading to the Yangtze River.

(5) Starting from Kashing and ending at Hang-chow Bay via Ping-hu and Chapu.

As the first line will connect with the Shanghai-Taichong automobile road, negotiations are being carried on between the two auto bus companies for joint service.

New Road, Nantungchow.—Since the removal of Nantungchow city wall many new structures are being planned.

For facilitating communication, the public works department will build a modern road from Yu-wu-jao to Tsi-fai-tien via Mar-chen-mu connecting with the Chung-hsuan-shan road at Hao-pei.

Chenkiang-Wusih Auto Bus Service.—At a meeting of the promoters of the Chenkiang-Wusih Automobile Transportation Company, it was decided that auto buses would be run on rails to be laid out along the motor road. A set of regulations has been laid down and application for approval and registration made to the local authorities.

Shanghai-Minghong-Nanwei-Tsoling Auto Bus Co.—The Shanghai-Minghong-Nanwei-Tsoling Automobile Transportation Co., under the managership of Mr. Lee Ying-shih, in co-operation with the authorities, has begun the purchase of lands for the construction of motor roads through four districts, aggregating 91 *li* in length. There will be built seventeen re-inforced concrete bridges before June, 1922 when auto bus services will be inaugurated. Construction of the bridge at Tsao-hu-ching with an arch of 30-ft. wide and the one at Chang-chiar-ping with an arch of 20-ft. wide was started on the 8th inst., while the others from Pao-nan to Tso-lin will be commenced on the 18th inst.

Shanghai-Tsoling Auto Bus Co.—While the Shanghai-Mingkong-Nanpoo-Tsoling Automobile Transportation Co. has recently placed an order with Leewoo & Co., a German firm, for ten passenger and freight cars. The former costs Tls. 2,700 each and the later Tls. 2,750 each, and the cars are expected to arrive at Shanghai in April, 1922.

Shensi Auto Bus Service.—General Tsao Kun has promised to set apart twenty automobiles for running a service between Sian and Dung-kwain of Shensi.

Chefoo-Weihsien Motor Road Traffic.—An autobus service has been inaugurated on the Chefoo-Weihsien road as far as to Sha-ho, the western boundary of Yih-hsien, a distance of over 200 *li*, from Chefoo. The section between Sha-ho to Chiar-ho in Cho-yuen-hsien, on which bridges have been completed, will be ready for traffic next spring.

Motor Works Burnt.—Damage estimated totaling about Y.800,000 resulted from a fire in which nine of the factories of the Tokyo Street Motor Car Company at Senjyu in the suburbs of Tokyo were destroyed. About 60 motor cars awaiting repairs and in course of construction were destroyed.

Tractors in the Philippines.—The increase in the use of tractors has been remarkable. In 1917, 4 tractors were sold in the Philippines ; in 1918, 6 ; and in 1919, 597, while during the fiscal year ended June 30, 1920, over 800 were sold. This great increase was largely in consequence of a tractor demonstration held at the government demonstration farm at Alabang in October, 1919, where 10 tractors were tested under the most exacting conditions. As a result of these trials, tractors won a place in Philippine agriculture. It was found that a tractor meeting the conditions should be able to pull three 14-inch plows and should have 12 horse-power at the drawbar always available. Fourteen-inch moldboard plows and 26-inch disk plows were found to be most satisfactory, depending on different conditions of soil. For several years there has been an increasing shortage of draft animals in the Philippines, due to the prevalance of rinderpest among the carabaos, and for that reason it has been necessary to find another means of motive power. This accounts in part for the general increase in the use of tractors, and while there are certain uses for which the carabao is indispensable, yet the indications are that the tractor will soon supersede the carabao to a very large extent in supplying motive power.

Roads in Heung Shan.—Mr. Wu Tit-sing, the new magistrate of Heung Shan, has proposed to open the public roads in the city. Ten surveyors were employed from Canton to make surveys.

Canton Roads.—The survey of a public road from Canton to Tsing-Sing district, which was proposed by the public road bureau, is now finished says the *Canton Times*. The road will start from Sha-hoo, outside the east gate, *via* Inn-tong and through the foot-path of the white cloud mountain directly to the district of Tsing-sing. The road line is estimated to be more than 60 miles. The work will begin soon.

The public works department issued an announcement that several maloos will be opened in Saikwan in order to facilitate communications in that part of the city.

Starting from the western end of Sap Sam Hong Street, a 40-ft. maloo will be built to the eastern end of the street with a 10-ft. sidewalk on each side of the maloo. Another maloo of the same width will connect the west bund and the present Sap Sam Hong Street. The Wing Yang Street and the Tak Cheng Street will be widened to 20 and 24 feet respectively.

The above schedule has been approved by the executive council of the municipality and P.W.D. officials are surveying in these places.

Road Construction, Kashing.—Mr. Kao Shu-li, chairman of the chamber of commerce at Kashing, Chekiang is raising a fund for constructing a modern road along See-hu Street from East City Gate to North Gate.

Road Construction : Woosung.—The Woosung port improvement work bureau has officially announced that roads along the Woosung Creek and Sze-dong starting from the station of the Shanghai-Woosung railway on the east and ending at Tsi-shun-an Bridge on the west, which have been surveyed and for which tenders have been called, will be soon constructed.

Auto Bus Service, Harbin.—An automobile service from Harbin to Ching-hua-chuen viâ Shan-sing, Chiar-mow and Sze-foo has been inaugurated.

Automobile Co., Increases Capital.—The Shanghai-Nanway Automobile Transportation Co. is now being organized, has announced the increase of its capital to $500,000 as authorized by the committee to extend the proposed service.

Automobile Road, Kiangsu.—Messrs. Wang Mow-ting and Yao Pao-teh, gentry of Zingkiang, have planned to build a modern road between Zing-kiang, Kiangsu, from Pai-yu-kong-kow, 18 *li* in distance, and operate a auto bus service. A meeting was held in the local chamber of commerce and a fund of $3,000 has been so far obtained.

North Automobile Co.—Auto bus service of the Pei Fong or North Automobile Transportation Company was inaugurated between Sao-tsian, Anhwei, and Hsuchow, Kiangsu, viâ Yung-chen and Kwanteh in Honan and Bao-hsien in Anhwei. The fare from Sao-tsian to Hsuchow is $6 for a single journey.

Provincial Roads, Kwangsi.—Reports from Wu-chow state that the Kwangsi provincial road construction bureau consisting of four departments has been formed with Mr. Soo Wu-yah as director. According to the schemes formulated by the bureau, the road from Mong-kiang to Kwei-ling will be built first, as it is a highway, very important in military service. A fund will be appropriated for preliminary servey of the line.

Paved Road at Nantungchow.—At Hao-nan, Nantungchow, a modern road, 12 *li* long, has been completed, and inauguration ceremony was celebrated on December 1, 1921.

Heilungkiang Auto Bus Line.—From Heilung-kiang to Heiho, a distance of about 800 li, an auto bus service is operated every winter when the bandits are most active. The company is preparing to resume business this winter.

Canton Motor Bus Line.—The motor bus line in Canton is operating 15 trucks, equipped with passenger bodies of a Chinese-make and each truck hauls a trailer which is similarly equipped. One unit, consisting of a truck and trailer, has a seating capacity of 70 persons.

Canton is a city of over 1,000,000 population, and, until only a year or two ago, when reconstruction work was begun, there were only 15,000 feet of road in that city sufficiently wide to accommodate wheeled traffic. That stretch of road was along the water front. In 1919 work was started to tear down the old city wall, build a modern road in its place, and remodel the city streets on a more modern plan. With this work recently completed, the new motor bus service was put into operation.

Regular fast service, 15 hours a day, to any part of the city is now given the populace of Canton.

The Shanghai-Taichong Long-distance Automobile Company will commence its service from Chapei to Lutien in January 1922.

Motor Service, Peking.—Hu Teh-kung, of Peking, has petitioned for permission to inaugurate a passenger and goods motor service between Nanyuan and Peiyuan, Peking.

The Yue K'ang Transportation Company, Ltd., has been organized by Mr. Yuan Chi-wu with a capital of $100,000. Its head office is at Hsuchow, Kiangsu. The ministry of agriculture and commerce has been petitioned for registration.

Chinese Automobile Company.—The Yangtze Machinery Works has turned out an automobile, which, when compared in quality and workmanship, is stated to be in no way inferior to foreign makes. Patent rights have been obtained from the ministry of agriculture and commerce. The company intends to enter into competition for the China market with other manufacturers.

Harbin Motor Truck Service.—The Russo-Asiatic Bank, Harbin Pristan, whose telegraphic address is "Sinoprist," notifies that orders of every description for handling and forwarding of goods by rail will be accepted at its counters. The bank has godowns situated in various parts of the city for storage of all kinds of merchandise and cellars, specially arranged for storage of wines. Delivery of grain for storage can be made at the Anda Station of the C.E.R.. The transportation of goods within the boundaries of the city is effected by means of motor trucks.

Road Construction, Kwangsi.—A sun of $60.000 has been appropriated by the magistrates of Nanning and Pingchow, Kwangsi, for the building of a road between the two cities.

INDUSTRIES

The Tung Hua Cotton Mill at Ward Road, Shanghai, a Japanese enterprise, will erect a second mill at the northern side of its premises, with machines imported from the United States.

New Arsenal, Mukden.—The Mukden arsenal was originally intended to have a capital of $4,000,000, of which one-half was to be provided by Fengtien and one quarter each by Kirin and Heilungkiang, but as it is to be extended the amount is insufficient. General Chang has now decided that another four million dollars are needed, of which one-half is to be raised by Fengtien and the other half by Kirin and Heilungkiang.

Fengtien Arsenal.—On the occasion of a banquet given to the managers of leading Chinese banks at Harbin by the tuchuns of Kirin and Heilungkiang, General Sun Li-chen and General Wu Tsing-sung stated that one of the important objects of their visit to Harbin was to arrange for the organization of an arsenal at Lien-shan-wen, Fengtien, as proposed by Marshal Chang Tso-lin. As the scheme will call for an enormous expenditure, they asked for assistance of the local financiers. Fifty per cent. of the fund required is to be raised from Fengtien, thirty per cent. from Kirin and twenty per cent. from Heilungkiang.

New Iron Works.—The ministry of agriculture and commerce has granted registration to the China Iron Works, Ltd.

Flour Mill, Shanghai.—The Shun Hua Paste Manufacturing Co. has announced an increase of capital by one million dollars, to be used for erecting a flour mill at Sao-shiao-doo, Shanghai. The factory building has been completed and machinery installed.

Glass Factory, Mukden.—A glassware manufacturing company is under organization at Si-kwan, Mukden, by Mr. Fu, an experienced expert in that line.

New Dyeing and Weaving Co., Shanghai.—The Sing Hua Dyeing and Weaving Factory, promoted by Mr. Yih Ting-sing about three years ago, has now completed its preparatory works. The factory building is located at Chapei and the office is at Lao-cha-jao. When machinery ordered from abroad has been installed, operation will commence.

Shanghai Soap Factories.—There are more than thirty soap and candle manufacturing companies in Shanghai established by Chinese.

A New Printing Company, Hangchow.—The Chekiang Printing Company, capitalized at $50,000, is being organized at Hangchow by Messrs. Jue Sun-pai, Chu Hung-tan, Chang Ju-chuen, Kao Tze-ting and Chang Mong-lin.

New Mill, Nantungchow.—The construction of the Dah Sun Cotton Spinning and Weaving Factory, mill No. 8 at Kiang-chiar-jao, Nantungchow, is making good headway. The structure is of re-inforced concrete. Machinery, spindles and other equipments ordered from abroad have arrived.

Phosphorus Factory, Tsinan.—The Shantung Agricultural Association at Tsinan has proposed the organization of a phosphorus factory to supply materials to Chinese match factories. A meeting was held by the association and a number of local merchants interested.

Textile Plant Expands.—The Dah Sun Textile Plant at Tang Cha, Nantungchow, has decided to increase its capital by $22,000 for purchasing additional machinery and expanding its factory building.

Silk Mill, Chinkiang.—The Tan Hua Silk Mill to be run by electric power is being organized at Tan-yang, Kiangsu, with a capital of $100,000. Mr. Tan Tsuh-chung is appointed as general manager and Mr. Kwan Wei-way as assistant manager and engineer-in-chief. Its factory building is in the course of construction and operation is expected to commence in next spring.

New Fishing Co., Shanghai.—The Kiangsu and Chekiang Fishing Co., Ltd., is being organized at Shanghai by Messrs. Lee Sui-kiu, Hsu Han-nan, Woo Tseng-ching, Chao Sing-ming, etc. It is to have a capitalization of $2,000,000, divided into 100,000 shares of $10 each.

Industrial Development of Fukien.—Rapid improvement has been made in Fukien's industry during recent years, and a number of industrial plants organized. Among these, the largest is the Fukien Industrial Company at Foochow, manufacturing alcohol and leather. The factory is equipped with up-to-date machines and stocked with a large quantity of raw materials. At the alcohol plant, there is an artesian well having a depth of 270 feet, capable of supplying 2,000 piculs of water per hour. The alcohol is made from potatoes.

Kien Hua Match Factory, Lee Hua Silk Filature, Mei Lee Soap Manufacturing Co., Tseng Chung Cloth Weaving Mill and Foo Hua Factory are also noteworthy, their products enjoying a good sale on the market.

Paper Mill, Kirin.—A petition has been submitted to the ministry of agriculture and commerce by Mr. Pao for organizing the Shun Ling Paper Mill at Kirin.

Beet Sugar Refining Co., Manchuria.—The beet sugar plant at Foolan, Manchuria, run by Chinese officials and merchants since its reorganization, has made great improvement under managership of Mr. Yue Ching-dang.

Cigarette Factory, Shanghai.—The Nan Yang Bros. Tobacco Company propose to erect a new factory. It is reported that the company has purchased more than 20 *mow* of land at Yangtszepoo for this purpose.

Paper Manufacture, P.I.—The office of the bureau of foreign and domestic commerce of the United States in Manila has been conducting an investigation of the possibilities of paper manufacturing industry in the Philippines. It is believed that such an industry if efficiently managed, can count not only on the local demand, but also on China, whose consumption of imported paper has been increasing yearly.

Cold Storage, N.E.I.—The East Java Cold Storage Company, recently formed, will shortly start business at Sourabaya and Samarang. The company will deal principally in Australian meats, game and fruit.

Cotton Spindles in Japan.—An investigation made by the Japanese Cotton Spinners' Association revealed that on August 1 there were 3,963,528 spindles (3,914,158 ring spindles and 49,370 mule spindles) installed in the mills of the companies belonging to the association, an increase of 149,948 spindles over the number at the end of 1920. In yarn-twisting machines the spindles amounted to 51,791, showing an increase of 1,208 machines. The number of spindles of the companies which do not belong to the association is about 160,000 spindles, which will make, if added to the above total, more than 4,000,000 spindles. The companies which are not members of the association are mainly making fine yarns and calico yarns, and have an output of about 5,000 bales a month.

Development of British Indian Sugar Industry.—India has an annual consumption of 748,544 tons of foreign sugar, with a production of refined sugar of only 177,569 tons. It is obvious that there is ample scope for many times the number of factories now working in India. The prospect before the Indian sugar industry is very hopeful, as it can choose the most favorable parts of the country for supply for many years to come, and with the increased duty on foreign sugar, coupled with heavier freight and handling charges, it is considered that it would be well if capitalists devoted their time and attention more and more to developing the industry on a sound and scientific basis. There is ample scope, and the rise in the cost of production throughout the world, both of raw material and of the finished product, has told heavily in India's favor.

Heating Power House, Tokyo.—Establishment of a power house to supply heating systems in Tokyo is being considered by Mayor Goto who has called a German engineer to study the fuel problem which hitherto has prevented installation of the system. The engineer is experimenting with lignite as a fuel for generating gas and if the experiments are successful the establishment of the power house will not be long delayed, it is said.

Agricultural Machinery, F.E.R.—The Blagoveschensk department of industry has undertaken to carry out the extensive orders of the central government for the construction of agricultural machines and implements. To fulfil the orders the Chepurin and Afanassiev factories will be run full blast.

ARSENALS

Site of the Mukden Arsenal.—The agricultural experiment station at Mukden has been chosen as the site for the Fengtien arsenal. The architects' drawings for the new buildings have been submitted to General Chang Tso-ling for approval. Although tenders for constructing the arsenal will be invited next spring, a fund of $3,000,000 to meet construction cost having been appropriated, it is reported that Mr. Dac Lee-tsing, director of the Mukden arsenal, has sent a representative to Sweden to purchase machinery for manufacturing munitions. The light railway to connect the arsenal with the main line will start from the Peking-Mukden Railway station passing through Hsiao-Pei-pien-men, Dah-pei-pien-men and Hsiao-tung-pien-men direct to the arsenal. Mr. Foo Pao-kong has been appointed to take charge of the work which will be probably started within the year.

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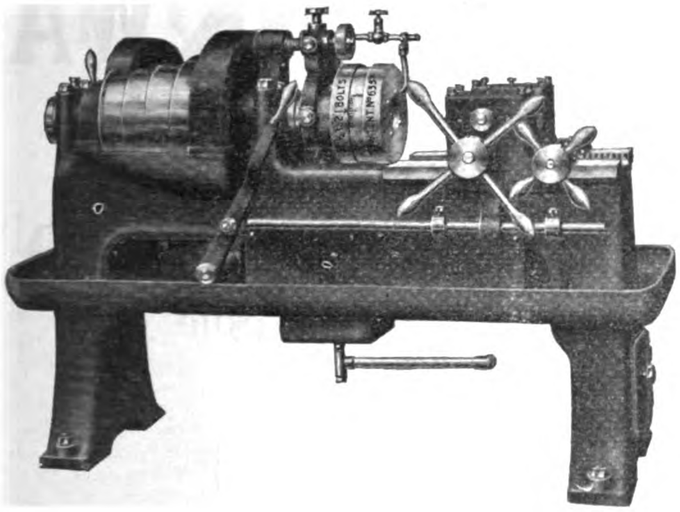

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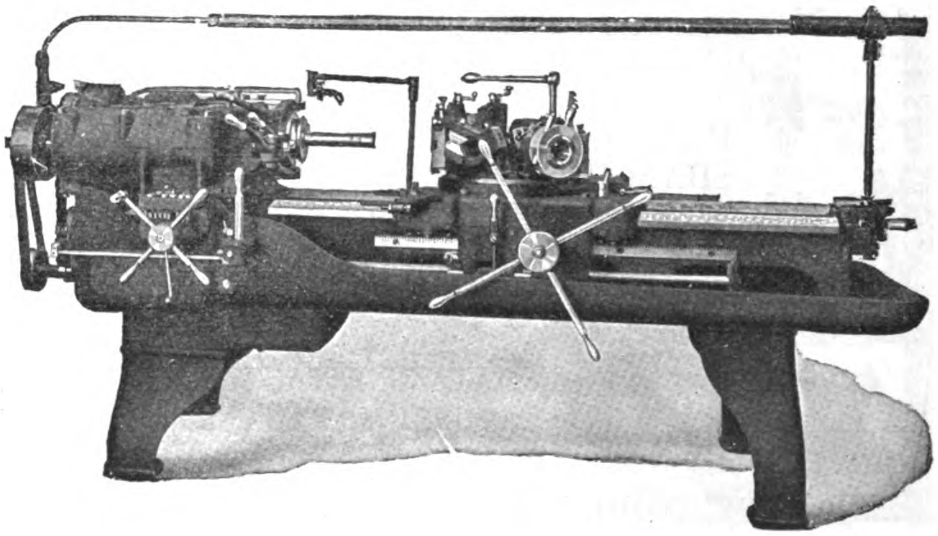

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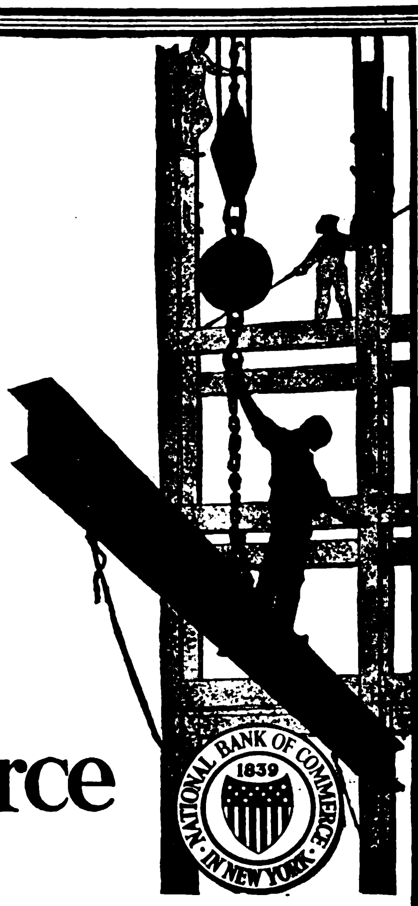

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Manchuria—Antung, Fengtien (Mukden), Dairen, Yingkow (Newchwang), Changchun, Harbin, Tiehling, Liaoyang, Ryojun, Kaiyuan, Chengchiatun, Szupingchieh, Fuchiatien, Kirin, Lungchingtsun
China Proper—Shanghai, Tientsin, Tsingtao, Tsinan
Siberia—Vladivostock, Alexandrofsky Post

NEW YORK AGENCY :

The City Investing Building, 165 Broadway, New York City

LONDON REPRESENTATIVE :

Gresham House, 24 Old Broad Street, London, E. C. 2

Correspondents :

San Francisco, Seattle, New York, London, Paris and in other commercial centers throughout the world

International Banking Corporation

CAPITAL, SURPLUS AND UNDIVIDED PROFITS: G. $14,000,000

OWNED BY THE NATIONAL CITY BANK OF NEW YORK

HEAD OFFICE: 60 WALL STREET, NEW YORK

LONDON OFFICE: 36 BISHOPSGATE, E.C.

LYONS OFFICE: 27 PLACE TOLOZAN

SAN FRANCISCO OFFICE: 232 MONTGOMERY STREET

BRANCHES:

CHINA
- SHANGHAI
- PEKING
- TIENTSIN
- HANKOW
- HARBIN
- HONGKONG
- CANTON

DOMINICAN REPUBLIC
- SANTO DOMINGO
- SANCHEZ
- SAN FRANCISCO DE MACORIS
- SAN PEDRO DE MACORIS
- SANTIAGO
- PUERTO PLATA
- BARAHONA
- LA VEGA

INDIA
- BOMBAY
- CALCUTTA
- RANGOON

JAPAN
- YOKOHAMA
- KOBE

JAVA
- BATAVIA
- SOURABAYA

PANAMA
- PANAMA
- COLON

PHILIPPINES
- MANILA
- CEBU

SPAIN
- BARCELONA
- MADRID

STRAITS SETTLEMENTS
- SINGAPORE

BRANCHES OF THE NATIONAL CITY BANK OF NEW YORK

ARGENTINA
- BUENOS AIRES
- ROSARIO

BELGIUM
- ANTWERP
- BRUSSELS

BRAZIL
- PERNAMBUCO
- RIO DE JANEIRO
- SANTOS
- SAO PAULO

CHILE
- SANTIAGO
- VALPARAISO

CUBA
- HAVANA AND 22 BRANCHES

ENGLAND
- LONDON

ITALY
- GENOA

PERU
- LIMA

PORTO RICO
- PONCE
- SAN JUAN

RUSSIA
- MOSCOW } Temporarily Closed
- PETROGRAD }

URUGUAY
- MONTEVIDEO

VENEZUELA
- CARACAS

Commercial and Travellers' Letters of Credit, Bills of Exchange and Cable Transfers bought and sold. Current accounts opened and Fixed Deposits in local and foreign currencies taken at rates that may be ascertained on application to the Bank.

N. S. MARSHALL, *Manager.*

1A KIUKIANG ROAD.

BANQUE DE L'INDO-CHINE.

Capital	**Frs. 72,000,000**
Reserves	**„ 70,000,000**

HEAD OFFICE: 15 BIS RUE LAFFITTE, PARIS.

Succursales et Agencies:

Bangkok	Haiphong	Mongtze	Pnom-Penh	Singapore
Battambang	Hankéou	Nouméa	Pondichery	Tientsin
Canton	Hanoi	Papeete	Saigon	Tourane
Djibouti	Hongkong	Peking	Shanghai	

Bankers:

IN FRANCE: Comptoir National d'Escompte de Paris, Credit Lyonnais; Banque de Paris et des Pays-Bas; Crédit Industriel et Commercial Société Générale.

IN LONDON: The National Provincial and Union Bank of England, Ltd.; Comptoir National d'Escompte de Paris; Crédit Lyonnais.

The Shanghai Agency undertakes all banking operations and exchange business; grants credits on goods and approved securities and receives deposits on current and fixed deposits according to arrangement.

L. ARDAIN, *Manager.*

The First National Bank of Boston

Transacts commercial banking business of every nature

Correspondence Solicited

Capital, Surplus and Profits

$37,500,000

SOUTH AMERICA

HEAD OFFICE: MONTREAL, CANADA

We offer a complete banking service in the following countries, special attention being given to the handling of collections.

ARGENTINE Buenos Aires (2 Branches).

BRAZIL Rio de Janeiro, Santos, Sao Paulo.

URUGUAY Montevideo.

VENEZUELA Caracas, Ciudad Bolivar. Maracaibo.

COLOMBIA arranquilla.

BR. GUIANA Georgetown, Rose Hall, New Amsterdam.

Also 99 Branches in CUBA, PORTO RICO, DOMINICAN REPUBLIC, HAITI, COSTA RICA, BR. HONDURAS, BRITISH WEST INDIES and FRENCH WEST INDIES

618 Branches throughout CANADA & NEWFOUNDLAND

LONDON Princes St., E.C.

PARIS 28, Rue du Quatre-Septembre.

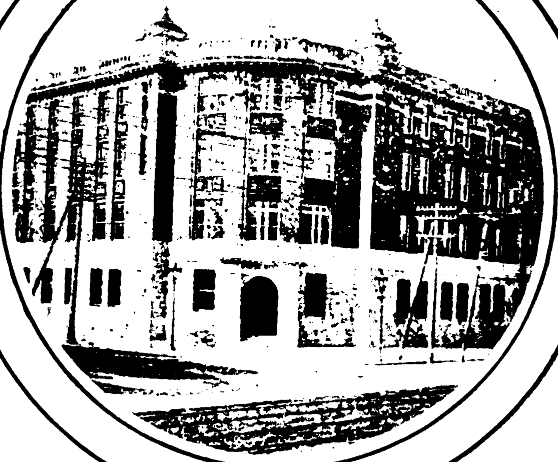
NEW YORK 68, William St

BARCELONA Plaza de Cataluna 6.

THE ROYAL BANK OF CANADA

CA PIAL PAID UP & RESERVES $41,000,000 GOLD

RESOURCES - - - - $530,000,000 GOLD



THE

BANK OF TAIWAN LTD.

INCORPORATED BY SPECIAL IMPERIAL CHARTER, 1899

Capital Subscribed - - - - - - -	Yen 60,000,000
Capital Paid-up - - - - - - -	,, 45,000,000
Reserve Funds - - - - - - -	,, 9,680,000

President: KOJURO NAKAGAWA, Esq. Vice-President: SHUNROKURO MORI, Esq.

DIRECTORS:

TSUNEKICHI IKEDA, Esq.
GUNJI KAWASAKI, Esq.
TADASU HISAMUNE, Esq.
KUMEMATSU MORINAGA, Esq.
MASUMI ESAKI, Esq.

Head Office: TAIPEH, FORMOSA (TAIWAN)

BRANCHES:

JAPAN: Tokio (General Affairs Department), Kobe, Moji, Osaka, Yokohama.
TAIWAN: Keelung, Tainan, Takow, and 11 other points.
CHINA: Amoy, Canton, Foochow, Hankow, Kiukiang, Shanghai, Swatow.
OTHERS: Bangkok, Batavia, Bombay, Hongkong, London, New York, Semarang, Singapore, Soerabaya.

AGENTS AND CORRESPONDENTS:

In the Principal Cities and Towns throughout the World.

LONDON BANKERS:

BARCLAYS BANK, LTD. LLOYD'S BANK, LTD. LONDON COUNTY WESTMINSTER & PARR'S BANK, LTD.

TOKYO BRANCH:

No. 1, Eiraku-cho Ni-chome, Kojimachi-ku.

Telegraphic Address: "TAIWANGINK."

Phone Nos. 1060, 1061, 1062, 1063, 1064, 1065, 1066, 446, 447, 448 and 449, Marunouchi.

Interest allowed on Fixed Deposits, and Current Accounts on terms which may be ascertained on application. Most favourable terms are granted for Petty Current Accounts.

Every description of Exchange and General Banking business transacted.

Special facilities are available for exchange business on China, Straits Settlements, East Indies, Australia, Great Britain, Russia, America, Canada, South Africa, etc.

Industrial Bank of Japan, Limited

(NIPPON KOGYO GINKO)

Incorporated by Special Charter in 1902 to Encourage Foreign Investments

CAPITAL SUBSCRIBED	- - - - -	Yen 50,000,000
CAPITAL PAID-UP	- - - - - - -	Yen 45,000,000

HEAD OFFICE:

MARUNOUCHI, TOKYO. CABLES "KOGIN," TOKYO

BRANCHES:

TOKYO: NIHONBASHI
OSAKA: KORAIBASHI
KOBE: NAKAMACHI

H. HIJIKATA, Esq., President
Y. ONO, Esq., Vice-President
K. IYANAGA, Esq., Director
T. IWASA, Esq., Director
KOZO MATSUMOTO, Esq.

AUDITORS:

NAGATANE SOMA, Esq.
KINTARO HATTORI, Esq.
KINICHI KAWAKAMI, Esq.
TAICHI OHBA, Esq.

All descriptions of general banking, exchange, both foreign and domestic, and trust and corporation financial business transacted.

Correspondents in the principal cities at home, and in London, Paris, New York, and San Francisco.

BUSINESS TRANSACTED:

1.—Loans on the security of public bonds of debentures and shares, estates (Zaidan), specified land and buildings.
2.—Subscription and underwriting public bonds or debentures.
3.—Deposits and safe custody of valuables.
4.—Trust company business.
5.—Discounting of bills.
6.—Foreign exchange business.
7.—Other banking business sanctioned by the Minister of State for Finance in accordance with Law of Ordinance.

BANK OF COMMUNICATIONS

(Specially authorised by Presidential Mandates of April 7th, 1914 and October 31st, 1915 making the Bank of Communications a National Bank).

Head Office: Peking

CAPITAL . . Kuping Tls. 10,000,000

President: TSAO JOU LIN

Vice-President: JEN FUNG PAO

Every description of Banking and Exchange business transacted.
Interest allowed on Current Accounts and Fixed Deposits according to arrangement.
Credits granted on approved Securities.
Special Facilities for Transfers to all parts of China.

Branches

CHIHLI PROVINCE.—Peking, Tientsin, Tungchow, Paotingfu, Haitien, Tangshan, Shuntefu, Shengfang.

SHANTUNG PROVINCE.—Tsinanfu, Tsininchow, Chefoo, Techow, Tsaochwang, Lungkow.

HONAN PROVINCE.—Kaifeng, Lohyang, Chengchow, Chiaotso, Chowchiakow, Taokow, Leiho, Hsinhsiang, Changtefu, Hsinyangchow.

SHANSI PROVINCE.—Shihchiachwang, Tatungfu, Fengcheng, Yangkao.

KIANGSU PROVINCE.—Shanghai, Soochow, Wusieh, Chinkiang, Yangchow, Tsing-kiangpu, Pukow, Penpu, Hsuchow.

CHEKIANG PROVINCE.—Hangchow, Ningpo.

HUPEH PROVINCE.—Hankow, Shasi, Ichang.

KIANGSI PROVINCE.—Kiukiang.

HUNAN PROVINCE.—Changsha, Changteh, Yochow, Hengchow, Hsiangtan

SZECHUAN PROVINCE.—Chungking.

ANHWEI PROVINCE.—Wuhu, Anking, Hsuancheng, Panpu

KWANGTUNG PROVINCE.—Canton.

THREE EASTERN PROVINCES.—Yinkow, Fengtien, Changchun, Kirin, Tiehling, Sunchiatai, Liaoyang, Harbin, Chinhsien.

SPECIAL DISTRICTS.—Jehol, Kueihuacheng, Lenghsien, Chihfeng, Hsinsi, Kalgan (Chahar).

ABROAD.—Hongkong, Singapore.

THE SUMITOMO GOSHI-KAISHA

OSAKA, JAPAN

OWNERS OF BESSHI COPPER MINE, COAL MINES, SILVER AND GOLD MINES, ETC.

MANUFACTURERS OF

Tubes, Plates, Sheets and Bars of Copper, Brass, Bronze and other Alloys, Solid and Drawn Steel Tubes, Nails, Etc.—Superphosphate and Composite, Manure, Sulphuric and Nitric Acid, etc.

GENERAL WAREHOUSE AND BANKING BUSINESS

WORKS AND DEPARTMENTS

Warehouses ... ... Osaka, Kobe & Tokyo
Mining Offices ... ... Besshi, Wakamatsu, Sapporo & Ohgayu
WORKS:
Copper Works ... ... Osaka & Amagasaki
Fertilizer Works ... ... Niihama
Sales Departments ... ... Osaka, Kobe, Tokyo, Kure, Yokosuka, Hakata, Shanghai, Hankow and Tientsin

THE SUMITOMO STEEL WORKS, LTD.

OSAKA, JAPAN

President: Baron K. SUMITOMO

MANUFACTURERS OF

Steel Ingots, Steel Forgings, Steel and Iron Castings of Every Description for Railways, Shipbuilding Yards, Mines, Hydraulic Electric and Other Engineering Works, etc., etc.

THE SUMITOMO ELECTRIC & CABLE WORKS, LIMITED

OSAKA, JAPAN

President: Baron K. SUMITOMO

MANUFACTURERS OF

Copper, Brass, Bronze and Nickel Wires and Strips, Trolley Wires, Insulated Wires and Cables of Every Description for Telephone, Telegraph, Lighting, Power Transmission, etc., etc.

THE SUMITOMO BANK, LIMITED

Head Office: OSAKA, JAPAN
Cable Address: "SUMITBANK"
President: Baron K. SUMITOMO
Established March, 1912
(Successors to The SUMITOMO BANK)

Capital Subscribed	Yen 70,000,000	Reserve Fund	Yen 20,200,000
Capital Paid-up	„ 40,000,000	Deposits	„ 38,100,000

(as on 20th July, 1921)

Head Office: Kitahama, Osaka
City Offices: Semba, Bingomachi, Nakanoshima, Dotonbori, Kawaguchi, Tenma, Nipponbashi.
Home Branches: Tokyo (Tokyo, Toriaburacho, Fukagawa, Shinbashi, Asakusa), Yokohama, Nagoya, Kyoto (Kyoto and Nishijin), Kobe (Kobe and Hyogo), Onomichi, Niihama, Kure, Hiroshima, Yanai, Shimonoseki, Moji, Wakamatsu, Kokura, Hakata and Kurume.

Foreign Branches: Shanghai, Hankow, Bombay, London, New York and San Francisco.
Agents: The Sumitomo Bank of Hawaii, Ltd., Honolulu, Lloyds Bank, Ltd., London, National City Bank of New York, New York.
Correspondents: In all important places at home and abroad.

The Bank buys, sells and receive for collection Drafts and Telegraphic Transfers, issues Commercial and Travellers Letters of Credit available in all important parts of the world, besides doing general Banking business.

THE

MITSUBISHI BANK,

LIMITED

CAPITAL SUBSCRIBED - Yen 50,000,000
CAPITAL PAID-UP - - - Yen 30,000,000

PRESIDENT:

Baron Koyata Iwasaki

MANAGING DIRECTORS:

Mr. Manzo Kushida
Mr. Mikitaro Kikuchi
Mr. Kiyoshi Sejimo
Mr. Takeo Kato

HEAD OFFICE:

No. 1 Yayesucho Itchome, Kojimachi-ku,
Tokyo, Japan.

BRANCH OFFICES:

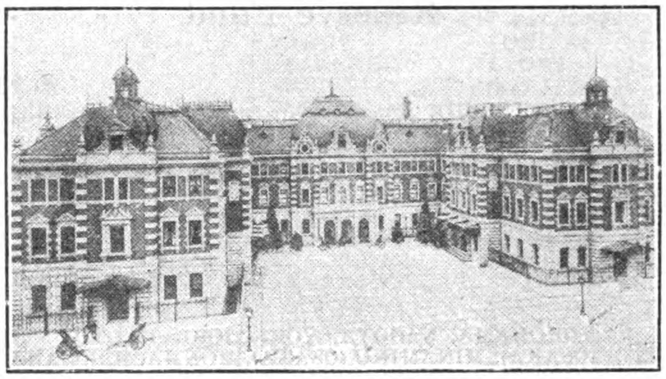
Fukagawa (Tokyo), Marunouchi (Tokyo), Nihombashi (Tokyo), Osaka, Nakanoshima (Osaka), Kobe, Kyoto, Nagoya, Shanghai, New York and London.

General Banking and Exchange Business

Agents for Hongkong and Shanghai Banking Corporation

THE MITSUI BANK, LTD.

The Oldest Bank in Japan, Founded in 1673



Capital Subscribed.......................Y. 100,000,000.00
Capital Paid-Up.........................Y. 60,000,000.00
Reserve Fund (July 1921)......Y. 28,000,000.00

HEAD OFFICE:

No. 1 Suruga-cho, Nihonbashi-ku,
TOKYO

BOARD OF DIRECTORS:

GENYEMON MITSUI, Esq. (*President*); SEIHIN IKEDA, Esq., UMEKICHI YONEYAMA, Esq., NAOJIRO KIKUMOTO, Esq. and OTOHIKO MAJIMA, Esq. (*Managing Directors.*)

TOMITARO HARA, Esq., KANETARO KISHIMOTO, Esq., HIROKICHI KAMESHIMA, Esq. and KIKUSABURO FUKUI, Esq. (*Directors*).

Branches:

NIHONBASHI (Tokyo), OTARU, YOKOHAMA, NAGOYA, KYOTO, OSAKA, NISHI (Osaka), KAWAGUCHI (Osaka), NAKANOSHIMA (Osaka), KOBE, HIROSHIMA, SHIMONOSEKI, MOJI, WAKAMATSU, FUKUOKA, NAGASAKI, SHANGHAI.

Foreign Agents:

London: Barclays Bank, Ltd.
London Joint City & Midland Bank, Ltd.
New York: The National City Bank of New York.
The Chase National Bank.
Bankers Trust Co.
Paris: Banque de l'Union Parisienne.
Comptoir National d'Escompte de Paris.
Bombay: National Bank of India, Ltd.

THE DAI-ICHI GINKO, LTD.

(FORMERLY THE FIRST NATIONAL BANK)

ESTABLISHED 1873

Subscribed Capital - - -	**Yen 50,000,000.00**
Paid-Up Capital - - - -	**Yen 36,350,000.00**
Reserve Fund - - - -	**Yen 29,500,000.00**

Y. SASAKI, *President*

K. ISHII, *Managing Director.* Y. NOGUCHI, *Managing Director.* S. SUGITA, *Managing Director.*

HEAD OFFICE:

No. 1 KABUTO-CHO, NIHONBASHI-KU, TOKYO.

T. AKASHI, *Manager*

CITY BRANCHES:

ISECHO, SHIN-OSAKACHO, FUKAGAWA, MARUNOUCHI.

HOME BRANCHES:

YOKOHAMA, NAGOYA, YOKKAICHI, KYOTO, NISHIJIN (KYOTO), GOJO (KYOTO), FUSHIMI, OSAKA, NISHIKU (OSAKA), MINAMIKU (OSAKA), HONMACHI (OSAKA), KOBE, HYOGO, HIROSHIMA, SHIMONOSEKI, CHOFU, MOJI, FUKUOKA, KURUME, KUMAMOTO, HAKODATE, OTARU, SAPPORO, MURORAN.

BRANCHES IN COREA:

SEOUL, FUSAN.

LONDON & NEW YORK BANKERS:

London: London County Westminster & Parr's Bank, Ltd.; The London Joint City & Midland Bank, Ltd.; The Yokohama Specie Bank, Ltd.

New York: The National City Bank of New York.; The National Bank of Commerce in New York.; The Yokohama Specie Bank, Ltd.

CORRESPONDENTS:

The Bank, in addition to its own Branches, has numerous Agencies or Correspondents in the principal Cities and Towns at Home and Abroad.

THE EAST ASIA INDUSTRIAL

COMPANY, LIMITED

(TOA KOGYO KABUSHIKI KAISHA)

TOKYO

ESTABLISHED 1909

FINANCIERS AND CONTRACTORS

K. ARAI, Esq., *President*

R. SHIRAIWA, Esq., *Managing Director*

Subscribed Capital	Yen 20,000,000
Paid-up Capital	„ 11,500,000

Branches: SHANGHAI, PEKING, HANKOW.

Hongkong and Shanghai Banking Corporation

Paid-up Capital	$20,000,000
Reserve Funds: Sterling	£4,500,000
Silver	$21,500,000
Reserve Liability of Proprietors	$20,000,000

Court of Directors:

G. T. M. EDKINS, Esq.
Chairman
G. M. DODWELL, Esq.
Deputy Chairman
D. G. M. BERNARD, Esq.
A. S. GUBBAY, Esq.
P. H. HOLYOAK, Esq.
Hon. Mr. A. O. LANG
E. V. D. PARR, Esq.
W. L. PATTENDEN, Esq.
J. A. PLUMMER, Esq.
H. P. WHITE, Esq.

Head Office:
HONGKONG

Chief Manager:
HONGKONG . . . Hon. Mr. A. G. STEPHEN

London Bankers:
LONDON COUNTY WESTMINSTER AND PARR'S BANK LTD.

Shanghai Branch: 12 The Bund
Sub-Agency: 9 Broadway

Branches and Agencies:

AMOY	LONDON
BANGKOK	LYONS
BATAVIA	MALACCA
BOMBAY	MANILA
CALCUTTA	NAGASAKI
CANTON	NEW YORK
CHEFOO	PEKING
COLOMBO	PENANG
DAIREN	RANGOON
FOOCHOW	SAIGON
HAIPHONG	S. FRANCISCO
HANKOW	SHANGHAI
HARBIN	SINGAPORE
ILOILO	SOURABAYA
IPOH	TIENTSIN
JOHORE	TSINGTAO
KOBE	VLADIVOSTOCK
KUALA LUMPUR	YOKOHAMA

Interest allowed on Current Accounts and on Fixed Deposits according to arrangement.

Local Bills Discounted. Credits granted on approved Securities and every description of Banking and Exchange business transacted. Drafts granted on London and the chief commercial places in Europe, India, Australia, Africa, China, Japan and America.

G. H. STITT, *Manager.*

THE JUGO GINKO, Ltd.

(THE FIFTEENTH BANK)

TOKYO, JAPAN

Telegrams: "Jugoginko, Tokio"

Capital Subscribed Y. 100,000,000 Capital Paid-Up Y. 49,750,000 Reserve Funds Y. 17,478,600

President:
HON. IWAO MATSUKATA

Vice-President:
MASAYASU NARUSE, Esq.

Managing-Directors:
YUTSUHA SATO, Esq. KANESATO AIKO, Esq.

Directors:
BARON KOKICHI SONODA
MARQUIS YORIMICHI TOKUGAWA
VISCOUNT YUKIYOSHI AOYAMA
HON. NAGAYUKI ASANO
YOSHITERU SHIMIZU, Esq.
MASAO MATSUKATA, Esq.
KIYOSUMI TANIKAWA, Esq.

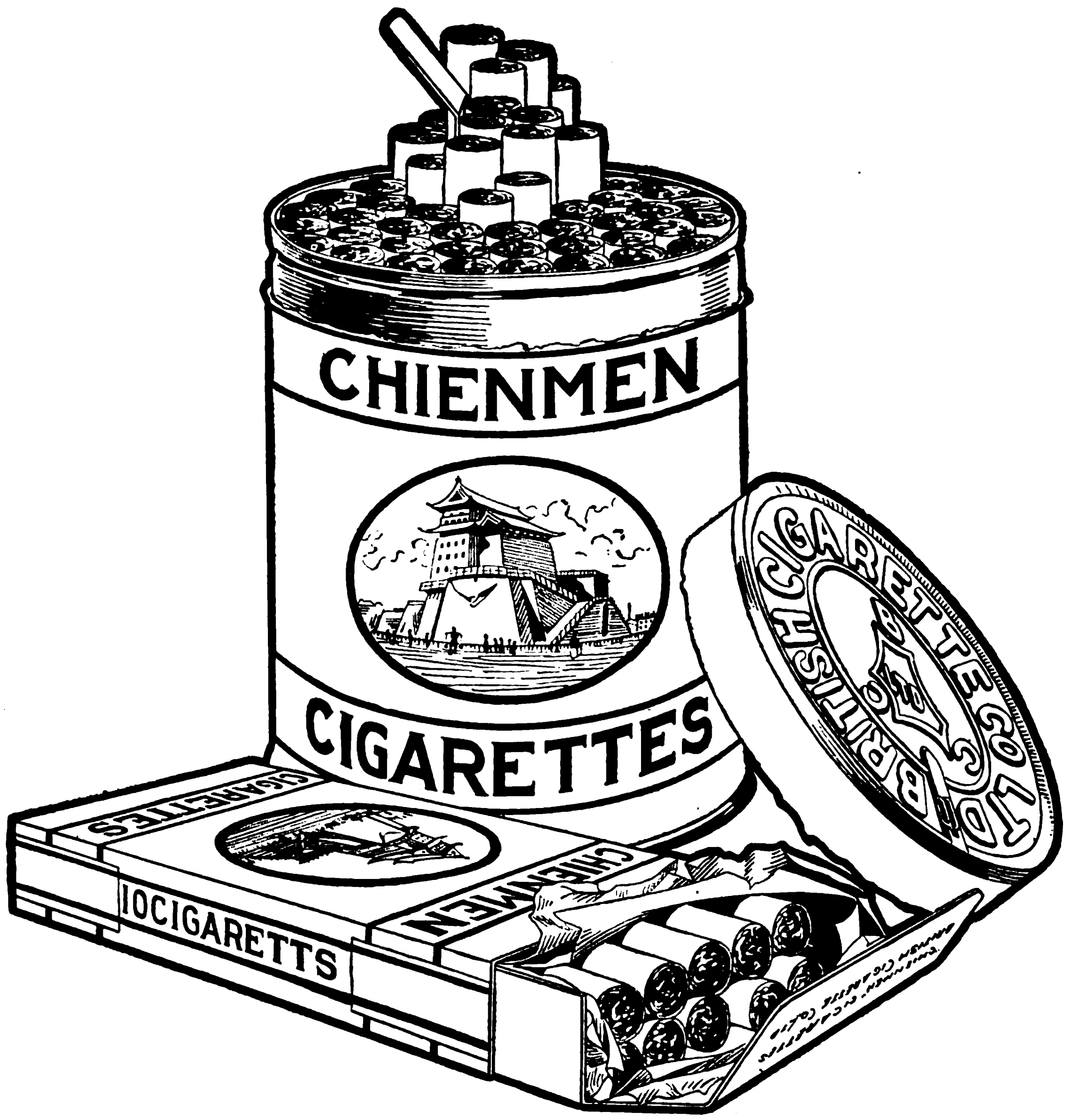
Auditors:
MASAKAZU HISANO, Esq.
BARON MICHITOMO IWAKURA
NAOYOSHI YAMAMOTO, Esq.
TAKAJI SEKIGUCHI, Esq.
TAKAYUKI IMAI, Esq.

Head Office Manager: **Kiyosumu Tanikawa, Esq.**

LONDON BANKS AND AGENTS:
LAZARD BROTHERS & CO., LTD. UNION DISCOUNT CO. OF LONDON, LTD.
LONDON COUNTY WESTMINSTER AND PARR'S BANK, LTD.

CHIENMEN

Cigarettes



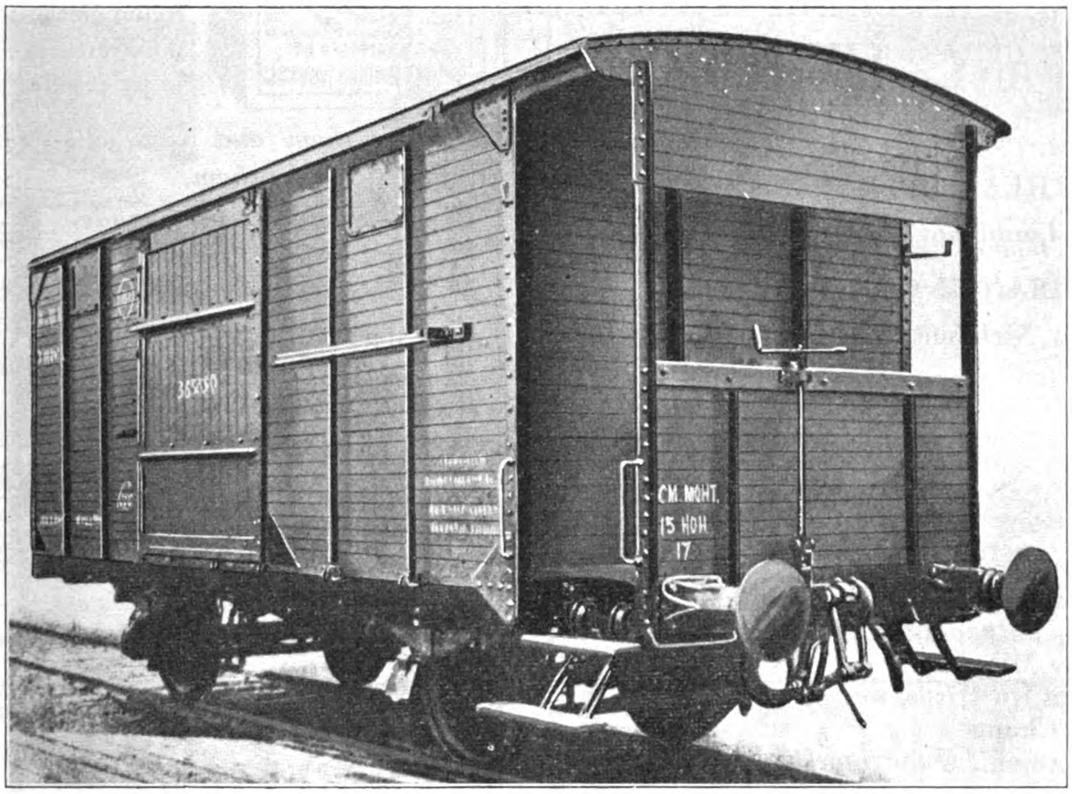
A brand well known to the "High Grade
Cigarette Smoking Public" of China.

BRITISH-AMERICAN TOBACCO CO. (CHINA), LTD.

Distributors

FOR SALE AT AN ATTRACTIVE PRICE

600-1,200 Pood (43,338-lb. capacity) New Russian Standard Covered Goods Wagons Complete
Located in U.S. Ready for shipment.



GENERAL DIMENSIONS

Length over headstock	24′ 11$\frac{5}{16}$″
Wheel Base	13′ 1$\frac{1}{2}$″
Width, Inside	9′ 0″
Length, Inside	22′ 9″
Width over roofs at eaves	9′ 8″
Height from rail over roof	12′ 5$\frac{15}{16}$″
Length over buffers	28′ 10$\frac{3}{16}$″
Tare, complete	23,900-lb.
Gauge	5′ 0″

GENERAL DETAILS

Steel Underframe, Wood Body, Brake Platform, Cast Iron Wheels, Westinghouse Air Brakes, Russian Standard Hand Brakes and Draft Gear, M.C.B. Standard Journal Bearings and Wedges, Forged Steel Buffer Stems, Draw Bar Hooks and Screw Couplings. Wagons are designed to handle Merchandise, Troops or Horses.

PRICE ON REQUEST

BRIGGS & TURIVAS, INC.

IRON & STEEL MERCHANTS

Main Office: CHICAGO, Ill., U.S.A. Cable Address: "BRIGTURVAS"

We also offer 35 Russian Decapod Locomotives. Specifications furnished if desired

AMERICA-JAPAN-CHINA TRUST COMPANY, LIMITED

HEAD OFFICE:
6 Nakabashi Izumicho, Kyobashi-ku, Tokyo.

BRANCH OFFICE:
11 Imabashi Nichome, Higashiku, Osaka.

CAPITAL - - Y. 50,000,000.00

Directors:

Michitaka Sugawara, *Chairman*
Seiji Nawa, *Managing Director*
Toyotsune Mikami
Count Kinjiro Hirosawa
Wu Ting Chang
Kenji Imanishi, *Managing Director*
Taiji Arai
Seishichi Iwasaki
Saburosuke Fujisaki
F. N. Shea

Auditors:

Kanzo Matsuo, Standing
Toyohiko Kuki
Motosaburo Kaneko
Takayoshi Kondo

Councillors:

Raizo Kanda
Katsutaro Kamada

Principal Business of this Company as follows:

1. Financing of Domestic and Foreign Enterprises.
2. Underwriting Public Bonds, Debentures and other Securities.
3. Guaranteeing Loans, Debts and Credits.
4. Issuing Letters of Credit and Accepting Bills.
5. Assisting in the Organization of various enterprises and in the financial re-adjustment of Companies.
6. All other kinds of Trust Business.

Smoke! Smoke!! Smoke!!!

The "Tas Hee" & "Szy Hee" brands of cigarettes.

They are not to be surpassed in excellence, selected from the most superior tobaccos, they will be found pleasing smokes by all. Connoisseurs agree that they are not to be excelled for their fragrance

Try them and you will like them.

Obtainable at very moderate prices from most stores and stalls.

中國南洋兄弟烟草有限公司啟

Manufactured by the
Canton Nanyang Brothers
Tobacco Co., Ltd.,
10 Dent Road

Head Office:
12 Nanking Road

BRILLIANT Half Watt LAMPS

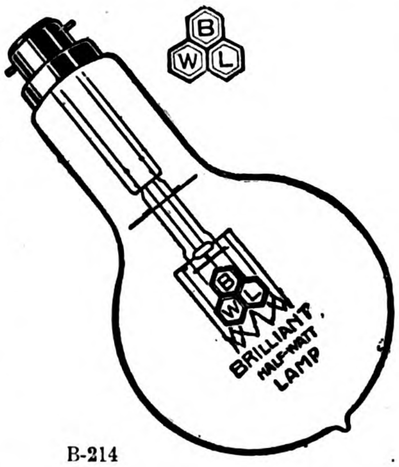
give MORE LIGHT, BETTER LIGHT at LESS COST than any vacuum lamp.

Call at our Show Room Nanking corner Honan Roads and we'll convince you.

THE BRILLIANT ELECTRIC CO.

Dependable Suppliers of Everything Electrical.

博利安半華德電泡
加倍光明減半電費



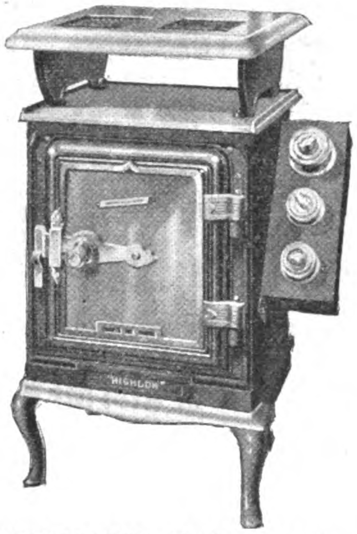
博利安電料公司
上海廣東路一號
電話中央三二六七

B-214

Electric Cooking "HIGHLOW" Apparatus

No. 50. IRON. Loading 500 Watts. Weight 6lbs.

Thumb rest.
Strong Tip-up Stand.
Best Nickel-plated finish.



ELECTRIC COOKER. Total Loading 4 kw.

No. 60. ELECTRIC KETTLE. 750 Watts.
Polished Copper or Nickel-plated, 2 pints Capacity.

Elements are wound on clear ruby mica with nickel contacts taken direct to the terminals.

Heating and Cooking Apparatus for Domestic, Ship's and Restaurant use.

Catalogue on request to the Sole Makers:

Archibald Low & Sons, Ltd.

Merkland Works, Partick, Glasgow, Scotland

Telegrams: "Highlow, Glasgow"

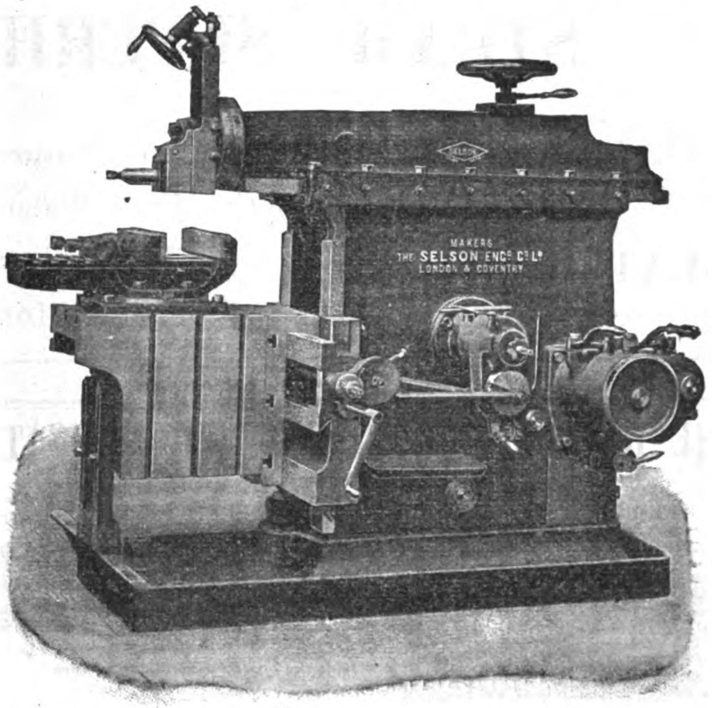
Code: A.B.C.

THE SELSON SHAPER

SELSON

stands for the Best.

Many repeat orders prove it.



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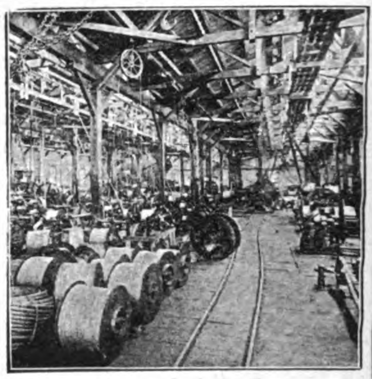

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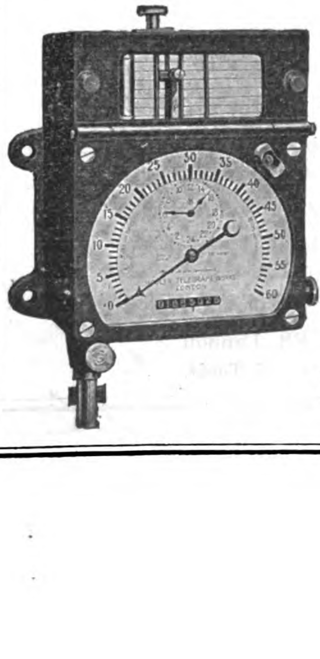


TELOC TYPE

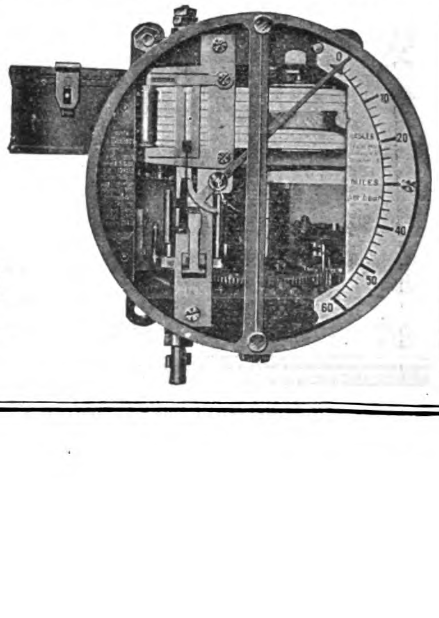
Chart Feed on a Mileage Basis of 10 m/m per Mile.

INDICATES:—Speed.
Total mileage since application of Instrument.
Total mileage of each run.
Time of Day in Hours and Minutes.
RECORDS:—Speed attained at any point of run.
Time the engine or coach is at work.
Distance covered.
Duration (up to 24 hours) and point of stops.
Time of Day in Hours and Minutes.
If desired apparatus to record working of Westinghouse or Vacuum Brakes.

HASLER TYPE

Chart Feed on a Time Basis of 4 m/m per Minute.

INDICATES:—Speed.
RECORDS:—Speed attained at any point of the run.
Time the engine or coach is at work.
Distance covered.
Duration and point of stops.
If desired bell can be fitted to ring at predetermined speed, or apparatus to record working of Westinghouse or Vacuum Brakes.



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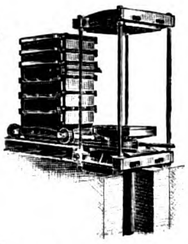

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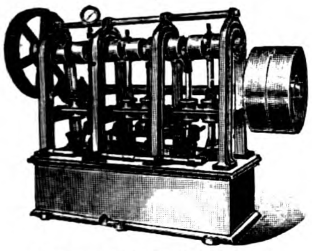

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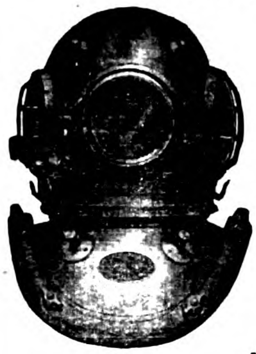

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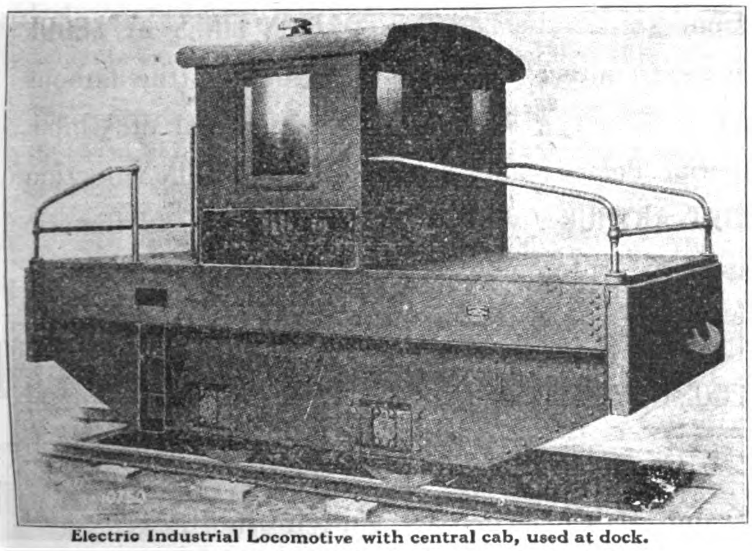
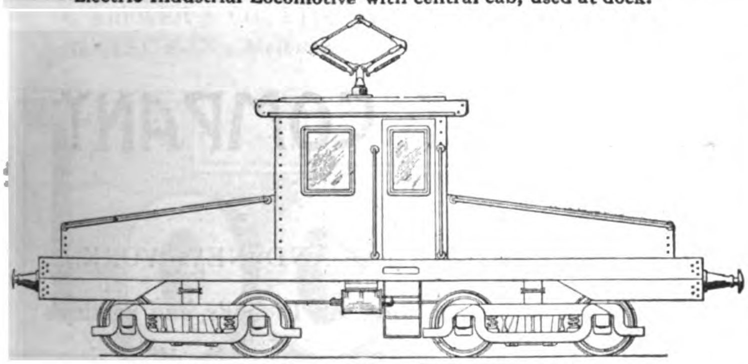


Electric Industrial Locomotive with central cab, used at dock.



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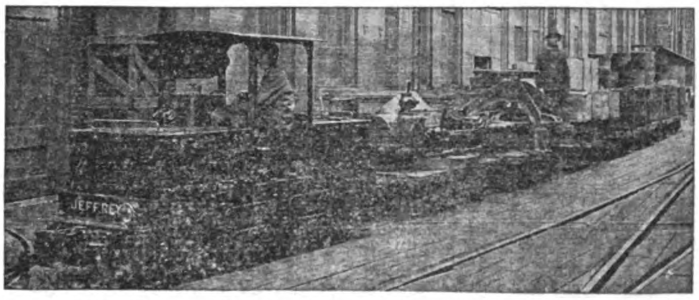

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Tourists in the Far East should not miss Manchuria. Through Japan, Chosen (Korea), and Manchuria (or vice versâ) is an ideal trip, combining the distinctive characteristics of three unique and profoundly interesting countries.

THE CHOSEN AND MANCHURIA LINES are under the management of the South Manchuria Railway Company. Express trains have been temporarily suspended (except between Fusan and Seoul and Dairen and Changchun), but the **ORDINARY TRAINS ARE EQUAL TO MOST AMERICAN TRAINS,** run at least twice a day from each end, and to some of them Sleeping and Dining Cars are attached. Sleeping berths should be reserved in advance.

HOTELS under the Company's management are established **ON FOREIGN LINES** at **SEOUL** (capital of Chosen), **FUSAN** and **SHINGISHU** (the two extremities of Chosen), **KONGOSAN** (the famous Diamond Mountain of Korea, rivalling Switzerland in scenery), **MUKDEN** (ancient capital of China, home of the Manchuria Dynasty, noted for Imperial Palaces and Tombs), **CHANGCHUN** (junction for three railways and "key to Manchuria"), **PORT ARTHUR** (of world-wide fame for its historic sieges and ruined forts), **DAIREN** (one of the greatest commercial cities in the Orient), and **HOSHIGAURA** (the finest seaside resort in North China).

FROM DAIREN there are **FREQUENT AND REGULAR STEAMERS** to and from Shanghai, Tsingtao, Tientsin, etc.

For pictorial guide-books, pamphlets, and further particulars, apply to the Tourist and Ticket Agencies, or direct to the

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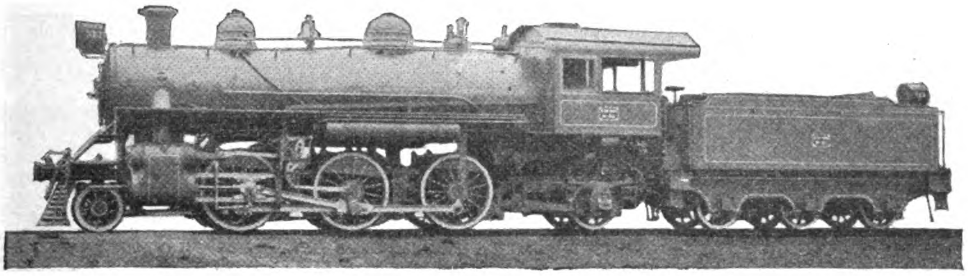

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Gauge, 4'8½". Cylinders, 20" by 26". Working pressure, 170 pounds. Driving Wheels, diameter, 59". Total weight, 155,000 pounds. Total weight, engine and tender, 247,500 pounds. Tractive force at 85% of working pressure, 25,500 pounds. Fuel, coal. Service, Passenger and Freight.

ON March 30, 1921, the Peking-Hankow Railway ordered thirty Prairie (2-6-2) type locomotives, similar to ten built and delivered by these Works in 1919.

The contract called for quick deliveries. Fifteen were to be finished in five and one-half months and the remaining fifteen one month later.

With our very complete facilities for purchasing the raw materials and fabricating all the parts, we were able to ship the 30 locomotives from our own docks on June 11. They were delivered at Hankow, September 4—JUST 5 MONTHS AND 5 DAYS AFTER RECEIPT OF ORDER.

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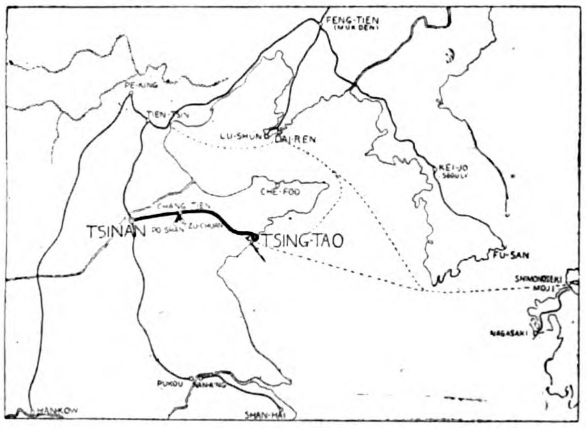
LOCOMOTIVES

SHANTUNG RAILWAY

The Shortest Route between Japan and North China



THROUGH TRAFFIC

Through passenger tickets are issued between the following principal stations of the Shantung Railway: Kiaochow, Kaomi, Fangtsu, Weihsien, Chingchow, Changtien, Choustun, Tsinan, Tzuchuan, Poshan, and the following points: In Manchuria—Port Arthur, Newchwang, Liaoyang, Fushun, Mukden, Tiehling, Kaiyuan, Changchun, Penchihu, Antung, and Dairen; in Japan—Tokyo, Yokohama, Nagoya, Kyoto, Osaka, Kobe, Ujina, Moji, Shimonoseki, Nagasaki and Shanghai.

Steamer Connections—Steamers leave the wharves of the Large Harbour, Tsingtao, for Moji and Kobe every five days, for Shanghai about twice a week and for Dairen about three times a week.

For giving facilities to through passengers for Japan, a special train in connection with the night train No. 4 is operated from the Harbour Station to the Wharf, direct alongside the ship, on those days when the liners of the Nippon Yusen Kaisha, Osaka Shosen Kaisha, and Harada S.S. Co. are leaving.

Through passengers and their luggage are carried free of charge for this section.

Collieries—The Tzuchuan (Shisen) and Fangtzu (Boshi) Collieries are managed by the Mining Department of the Shantung Railway.

At present the daily output of Tzuchuan coal is about 1,500 tons, far surpassing the amount taken out when the Germans were in control. The coal is well-known for its good quality and fair price.

Tsinan—Tsinan, the capital of Shantung, is the western terminus of the Shantung Railway, and also one of the most important stations on the Tientsin-Pukow Railway.

The Tsinan Railway Hotel, furnished in modern European style, is found on the upper floor of the Tsinan Station, under the control of the Shantung Railway Administration.

THROUGH TRAIN SERVICE

Train No. 1 leaves Tsingtao daily 8.00 a.m. arrives Tsinan 6.30 p.m.
Train No. 3 leaves Tsingtao daily 9.30 p.m. arrives Tsinan 8.30 a.m.
Train No. 2 leaves Tsinan daily 8.00 a.m. arrives Tsingtao 6.30 p.m.
Train No. 4 leaves Tsinan daily 11.00 p.m. arrives Tsingtao 9.30 a.m.

Local Trains run between Tsingtao and Kaomi, Weihsien and between Fangtzu and Tsinan, and on the Poshan and Tzuchuan colliery branches.

Fares—Tsingtao-Tsinan—1st class, $14.30; 2nd class, $7.20.

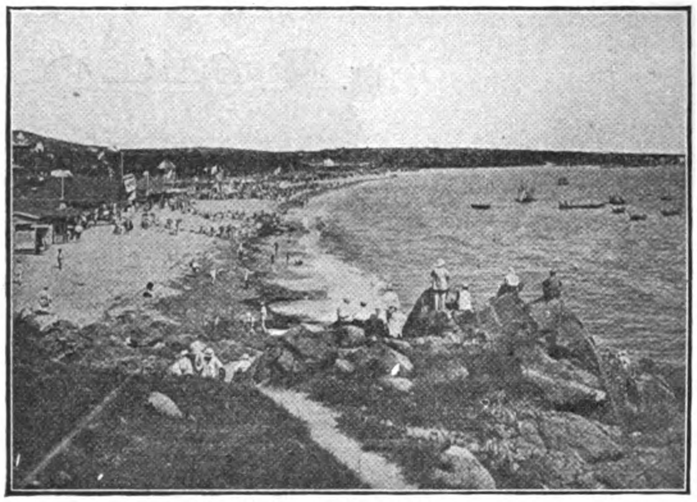
First Class Sleeping Car—A first-class sleeping car is attached to night trains Nos. 3 and 4 running between Tsingtao and Tsinan. For a berth in the sleeping car in S.Y. 3.00 for the lower berth and S.Y. 2.00 for the upper berth is charged in addition to the ordinary first-class fare, irrespective of distance.

Dining Car—A dining car is attached to through trains Nos. 1, 2, 3 and 4 running between Tsingtao and Tsinan. Meals are served to order at any time.

Ticket Agencies—Messrs. Thos. Cook & Son and their branch offices in various parts of the world. The Japan Tourist Bureau in Tokyo and their Agents in Yokohama, Kobe, Nagasaki and Peking.

Connections at Tsingtao—By steamer with Japan, Manchuria and Shanghai.

Connections at Tsinan—By Tientsin-Pukow Line with Tientsin, 6.00 & 9.38 a.m. daily, and with Pukow, 7.44 a.m. & 10.21 p.m. daily.



BATHING BEACH, TSINGTAO.

Description of Tsingtao

Tsingtao is considered the most healthful place in all the Far East. The scenery including both mountains and sea, is most beautiful. There are quite extensive forest gardens, bits of woodland here and there, and many delightful shady lanes affording most interesting walks through them.

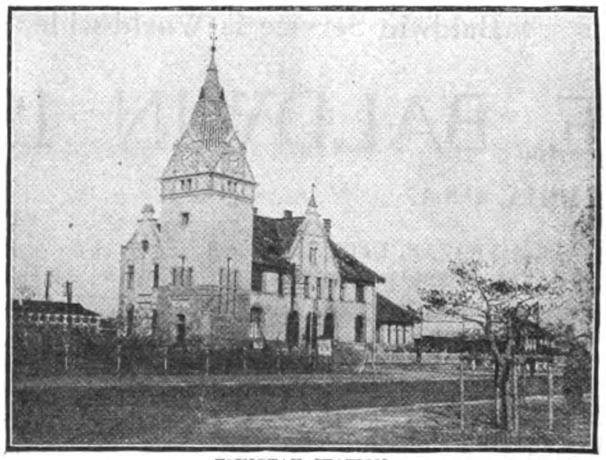
The roads are all broad, with very moderate gradients. They are of both macadamized and asphalt construction for vehicle traffic, while the sidewalks are either paved or concrete. These streets are practically all lined with beautiful shade trees.

The buildings are constructed principally in modern European style, with red tiles and white walls, contrasting pleasantly with the surrounding green mountains and blue sea.

The climate here is fine from Spring to Autumn, being neither too hot nor too cold. These climatic conditions make the place a favourite summer resort for Europeans and Americans from Shanghai, Tientsin, and other places.

The hotels are luxuriously furnished with up-to-date equipment and are under the efficient management of Mr. H. J. Hearne.

The hotel rates are $6.00 and up, per day, on the American plan.



TSINGTAU STATION

For Further Information, please apply to

THE SHANTUNG RAILWAY ADMINISTRATION, TSINGTAO

CABLE ADDRESS: "SANTETSU" CODES: A.B.C. 5TH ED. & AI.

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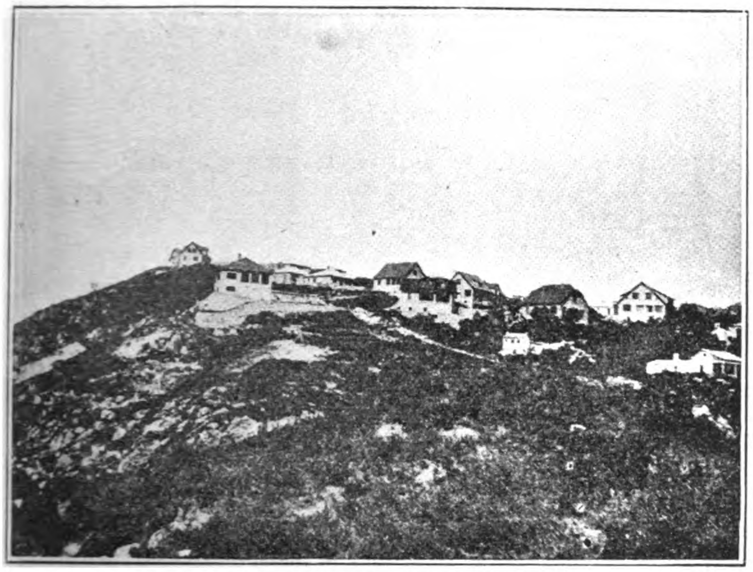
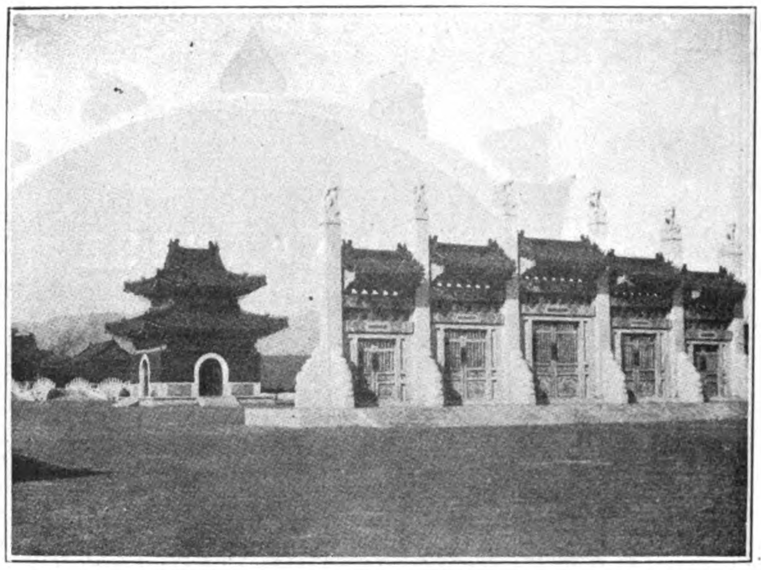


SUMMER RESORT AT CHI KUNG SHAN



AT THE CHUNG LING TOMBS

PEKING-HANKOW LINE

"The Road Through The Heart of China"

THE Peking-Hankow Line, the most important section of China's overland route, enables tourists and travellers to get a glimpse of Old China, the train passing through magnificent scenery, traversing the great plains of Chihli, the central portion of Honan and the mountainous regions of the eastern Hupeh province.

The Peking-Hankow route joins at Fengtai the main line of the Peking-Mukden Railway, by means of which this line is connected with the railways in Manchuria, Korea, Japan, and Siberia, while steamer facilities at Hankow bring it into easy communications with the Yangtze River ports and Shanghai.

From the Capital to Hankow the journey occupies 34 hours, by the daily through train which is provided with up-to-date sleeping and dining accommodations.

In the future, this line will connect by means of a ferry-boat the Hankow-Canton Railway whose completion will bring the Capital of China, and Hankow, the Great Central Market, within easy distance of Canton the southeastern metropolie.

From the Capital to Hankow the journey about 30 hours by the bi-weekly "Express" through train which is provided with up-to-date sleeping and dining accommodations.

Chikungshan Mountain (Summer Resort).—Not many Summer Resorts in China inland, can bear comparison with the natural charming views, that reward those who ascend the mountain of Chikungshan, whose summit stands at an altitude of 1,980 ft. On reaching Sintien station, situated 110 miles from Hankow, a serpentine road climbs the mountain, on top of which are hundreds of beautiful bungalows awaiting vacationists. This popular resort is celebrated for its scenery, where an almost unbroken communion with nature can be enjoyed for a week at a time.

Hsi-ling or Western Imperial Tombs.—With their present-day accessibility, there is now little excuse for visitors to Peking omitting a trip to the Western Imperial Tombs, undoubtedly one of the most impressive sights in China. The site of these beautifully adorned Imperial Tombs is close to Liang Ko Chwang station, 79 miles from Peking, which is reached by a Branch-line, formerly built for the exclusive use of the Imperial Sovereigns when visiting the Tombs of their ancestors. The Western Tombs include the mausoleums of four Manchu Emperors and three Empresses, as well as those of a number of Princesses. The region, as a well laid-out park, closely wooded, is justly appreciated for the charming scenery surrounding the Imperial Tombs and is highly recommended to any one in search of the extraordinary and beautiful.

For Particulars, Pamphlets, Reservations, Tickets, etc., apply to the "Information Bureau" at Peking Head Office or to Tourist Agencies.

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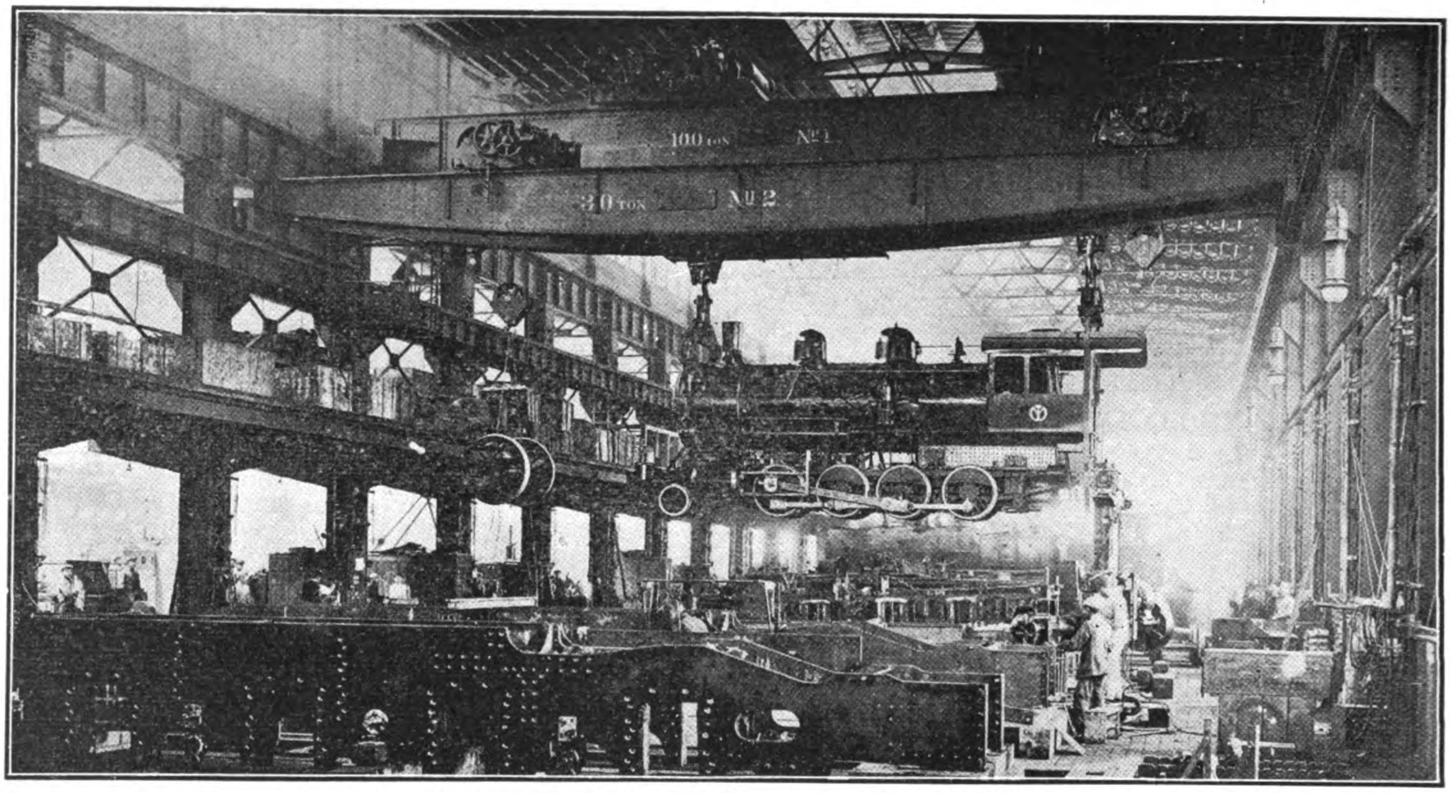
SOUTH MANCHURIA RAILWAY

RAILWAY

SHAKAKO WORKSHOPS



Interior of Engine Erecting Shop, Shakako Shops, S.M.R.

LARGEST AND MOST COMPLETE IN ALL MANCHURIA AND CHINA

AREA OF LAND: About 300,000 Tsubo. OFFICES & WORKSHOPS, 14,000 Tsubo

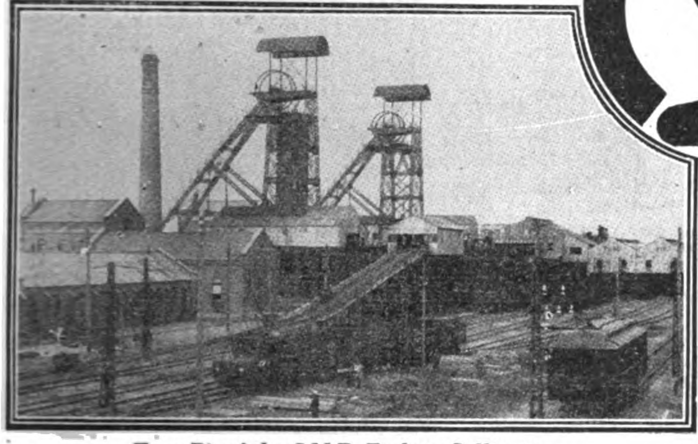
CAPACITY OF EXECUTING REPAIRS SIMULTANEOUSLY:

27 Locomotives, 36 Passenger Cars, and 130 Freight Cars, besides Constructing and Repairing other Railway Materials, Mining Machinery, etc. Employees: 5,000 Japanese and Chinese.

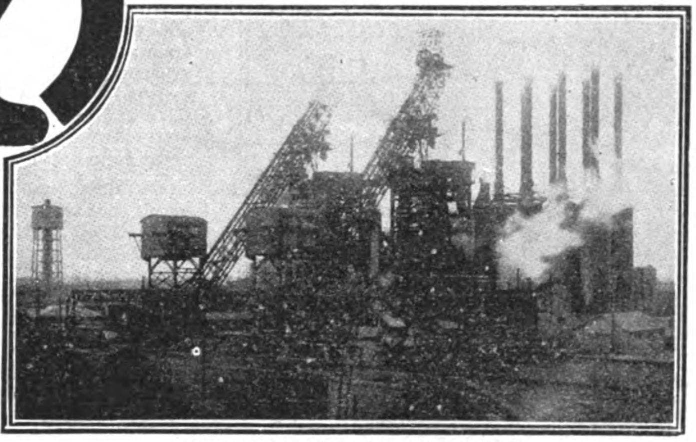
THE EAST IS EAST AND THE WEST IS WEST

SOUTH MANCHURIA RAILWAY

COAL IRON



Togo Pit of the S.M.R. Fushun Collieries



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Pamphlets and Particulars gratis from any of the above Depôts and Agencies, and from the

MINING DEPARTMENT,

South Manchuria Railway Company, Dairen

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New Enterprise Set Up Like Magic Amidst the Wilderness of Manchuria.

TRACT OF LAND: about 4,000,000 tsubo.

BLAST FURNACE No. 1 (with a capacity for about 350 tons per day) Opened to service on April 29, 1919.

BLAST FURNACE No. 2 (with a capacity for about 350 tons per day) Made ready for service on February 24, 1920.

MEANS OF TRANSPORTATION in the plant: 24 miles of railway and 2.5 miles of electric tramway in operation, with three light locomotives and a number of slag-, coke, and ore-cars of from 8 to 24 tons.

A NEW TOWN SITE of 400,000 tsubo, with the necessary roads and water and sewage services, laid out and rented to lessees.

OFFICIALS AND EMPLOYEES: 2,300 Japanese and Chinese.

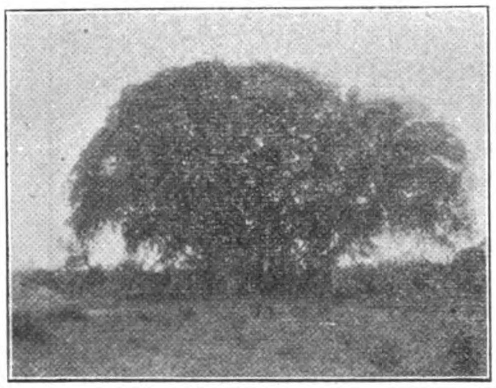
BUT THE TWAIN HAS MET AND BLENDED HERE

JAVA—THE WONDERLAND

HAVE YOU NOT YET VISITED JAVA? IF NOT, DO SO NOW!

Bridge Bi Cis, Soerabaia Goods-shed, Java State Railways, Soerabaia City.

Girl Carrying Capoc.



Waringin.

Java, the peerless gem in that "magnificent Empire of Insulinde, which winds about the equator like a garland of emeralds," is the ideal tropical island, the greenest, the most beautiful and the most exquisitely cultivated spot in the East, the most picturesque and satisfactory bit of the tropics anywhere near the world's great routes of travel.

It fulfils the conception of what a paradise ought to be. It satisfies the imagination and more—for no Northern imagination ever conceived of skies so soft or indolent as these, of seas so serene and beautiful, of landscapes so exquisite or of nature so bountiful.

There is something here for every taste. The sportsman will find excellent big game shooting—the architect and the archeologist will delight in exploring the ruins of Buddhistic and Hinduistic temples. Those studying social and political problems resulting from colonial possessions can study here one of the most successful colonial systems existing. The geologist will grow enthusiastic over the many volcanoes active or quiescent, found here. At Buitenzorg, one hour's run from Batavia, the botanist has at his disposition the largest and best equipped Botanical gardens of the universe. The agriculturist will delight in the many cultures as f.i. rice, tea, coffee, rubber, etc., found here. Moreover, travelers are entirely safe in Java and even ladies alone can tour the island without inconvenience.

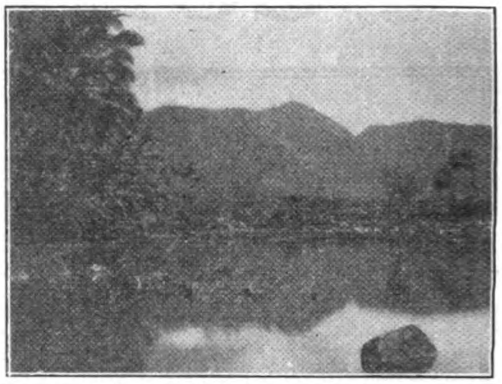
And to close this incomplete list of Java's advantages, it is singularly accommodating as regards climate. Thanks to the mountainous character of its physical conformation, and the different altitudes of its towns and hill stations, the visitor can select the climate best suited for his constitution. In a few hours he may change from the tropics to the temperate zone, may migrate from Batavia to Sindanglaja, 3,483 feet above the sea-level, or from Soerabaia to Tosari, at an altitude of 5,776 feet, and famous for its bracing air.

Few tourist playgrounds, in fact, are so favored, or possess a greater variety of attractive features.

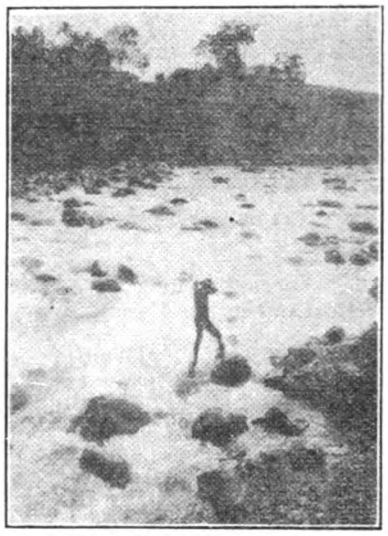
THE JAVA GOVERNMENT RAILWAYS own 2,629 miles of thoroughly equipped lines, passing through all the principal Tourist centres.

Comfortable travelling—frequent express and fast trains. Restaurant cars with efficient service in all express and fast trains.

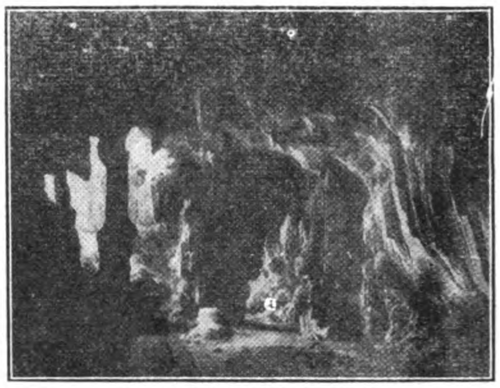
For full information and literature apply to the "Official Tourist Bureau" at Weltevreden, Rijswijk 18.



Pond in the Neighborhood of Garoet.



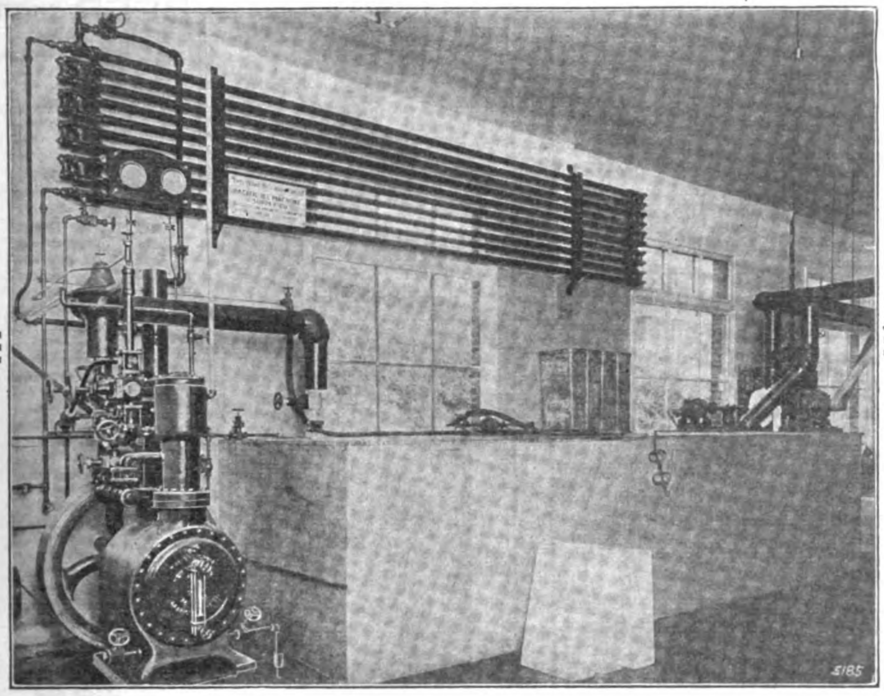
River Brantas, Malang.



Caves, South Coast, Java.

THE JAVA GOVERNMENT RAILWAYS

The photographs in this advertisement are from "The Joint-Stock Co., Photographer's Studio, Kurkdjian, Soerabaia."



BRUNSWICK ICE PLANTS

Here is the illustration of a typical standard Brunswick ice plant. It shows a plant which will produce two tons of ice daily. We also manufacture standard plants varying in capacity from two hundred fifty pounds to six tons. These plants are furnished for either steam or belt drive and are especially adapted to small towns, haciendas, plantations, large camps, cantonments, hospitals, etc.

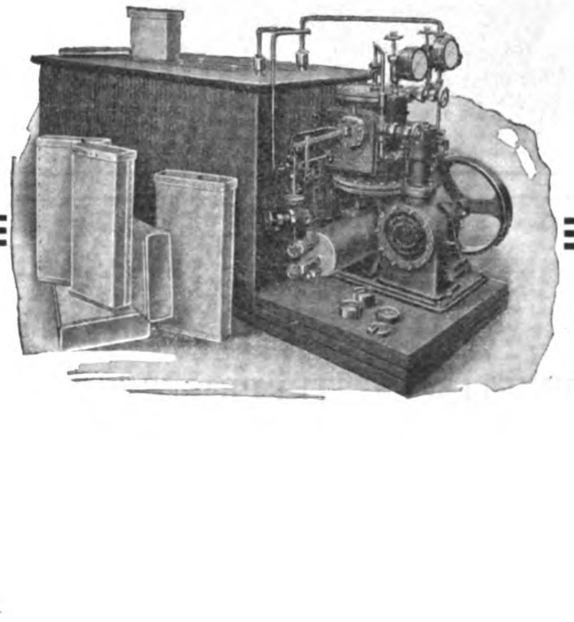
These plants are the finest of their kind. No pains have been spared to make them in every respect as perfect as possible. Their construction is simple. Their parts are few and interchangeable. They are strong, sturdy and rugged-built to stand hard usage and wear well. The running parts move free and true; the action is smooth and easy; the alignment of parts precise.

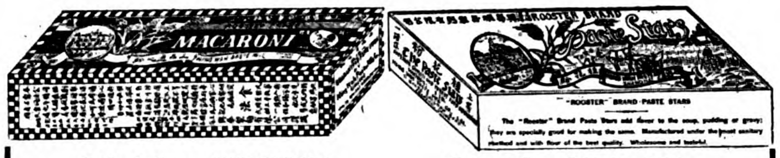
We want you to investigate these Brunswick ice plants if you are interested in ice-making machinery. You will find them built right, easy to operate, wonderfully efficient and dependable in every respect. Blue-prints and detailed instruction for installation and operation furnished with each plant.

A small, portable type is shown below. Detailed description in your own language on request.

BRUNSWICK
REFRIGERATING CO.,

New Brunswick, N.J., U.S.A.





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香港上海興華機器製麵有限公司

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Macaroni, Paste Stars, Egg Noodles, Vermicelli, and all kinds of Soup Stuffs

All our Pastes bear the "ROOSTER" label and are made with Flour of the Best Quality containing a large percentage of Gluten, and are manufactured under the most sanitary conditions. Having been analyzed by the Government Analyst of Hongkong, our productions have been found to be free from adulterations and from any injurious ingredients.

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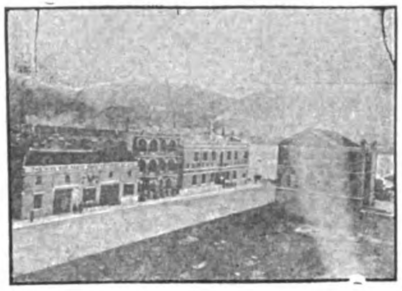

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THOMPSON PATENT SECTIONAL SUPERHEATER

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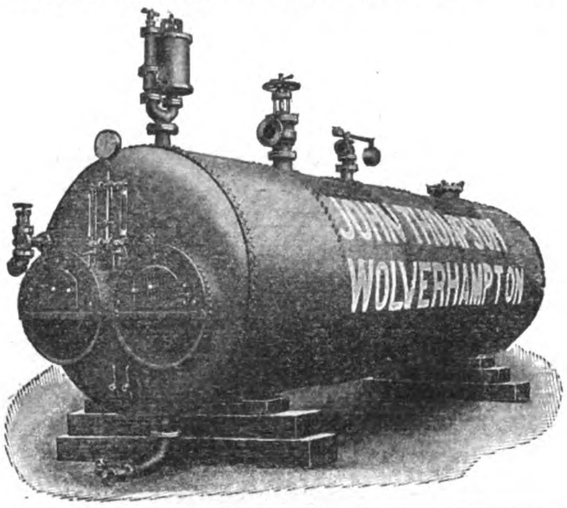

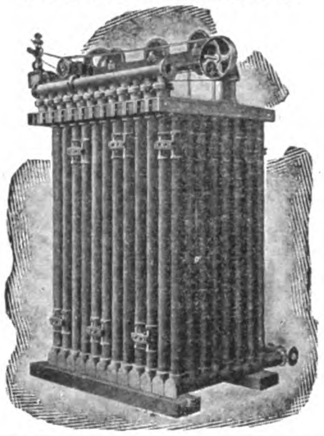

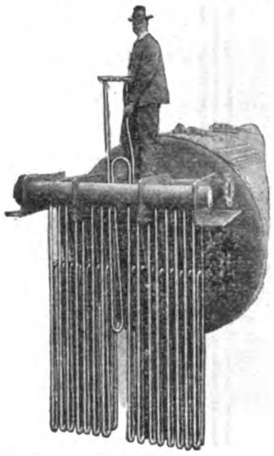

A New Feature—**THE FAR EASTERN REVIEW**

SERVICE BULLETIN

Information on Business Opportunities

EXISTING ENTERPRISES ENGINEERING PROSPECTS
RAILWAY CONSTRUCTION MINING DEVELOPMENTS

Star Brand Galvanized Sheets

STAR
—BRAND—
UNITED STATES STEEL
PRODUCTS COMPANY
NEW YORK. U. S. A.

THERE is frequent inquiry and a steady demand for a Galvanized Sheet with an EXTRA HEAVY COATING. To meet this situation we have placed on the market a special product which we are offering under STAR brand, as illustrated above, each and every sheet being stamped with this brand. This special sheet is made of special steel containing an alloy of copper, which is known as our "Keystone Copper Steel." This superior rust-resisting base is galvanized with an *extra heavy coating* of pure virgin zinc or spelter of the very best grade, thus insuring the greatest durability and effectiveness.

While the price of this extra quality sheet is quite naturally and necessarily higher than the well-known APOLLO brand, the charge therefor is only sufficient to cover the additional cost of manufacture. For Roofing and Siding of PERMANENT structures this high grade sheet is recommended without hesitation, the extra life more than making up for the increased first cost.

Our STAR brand sheets are offered only in formed material, such as Corrugated Roofing, Siding, Etc.

United States Steel Products Company

THE BUND AND CANTON ROAD, SHANGHAI, CHINA

22 WU LIANG TA JEN HUTUNG, PEKING, CHINA

15 NAKADORI MARUNOUCHI, TOKYO, JAPAN

The Green Island Cement Co., Ltd.

SHEWAN, TOMES & CO.,

GENERAL MANAGERS, HONGKONG

Are You Going to Build?

Insist on your Architect specifying the use of the best brand of Portland cement in construction. If the house or factory is to be blocks or tiles, they should be of concrete, if stucco, only the best cement should be employed; if reinforced concrete is used, only a standard cement will stand the test; if your building is to be fireproof, waterproof, safe against earthquake or typhoon, improving with age, and lowering the cost of insurance, you must employ concrete, and the best concrete construction is only secured through the use of

Green Island Cement

Green Island Cement is supplied in Bags = 250-lbs. net, Casks = 375-lbs. net, Iron Drums = 375-lbs. net.

Also, Glazed Stoneware, House Drains, Sewer Pipes, and Fittings, Paving Bricks, Tiles, Fire Bricks and Fire Clay.

The Green Island Brand has become the standard Portland Cement of Asia, owing to its purity, uniformity and tests.

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Manufacturers of Pure Manila Hemp Rope

Rope supplied to the British Navy on the China Station and to all Mail and regular Steamship Lines.

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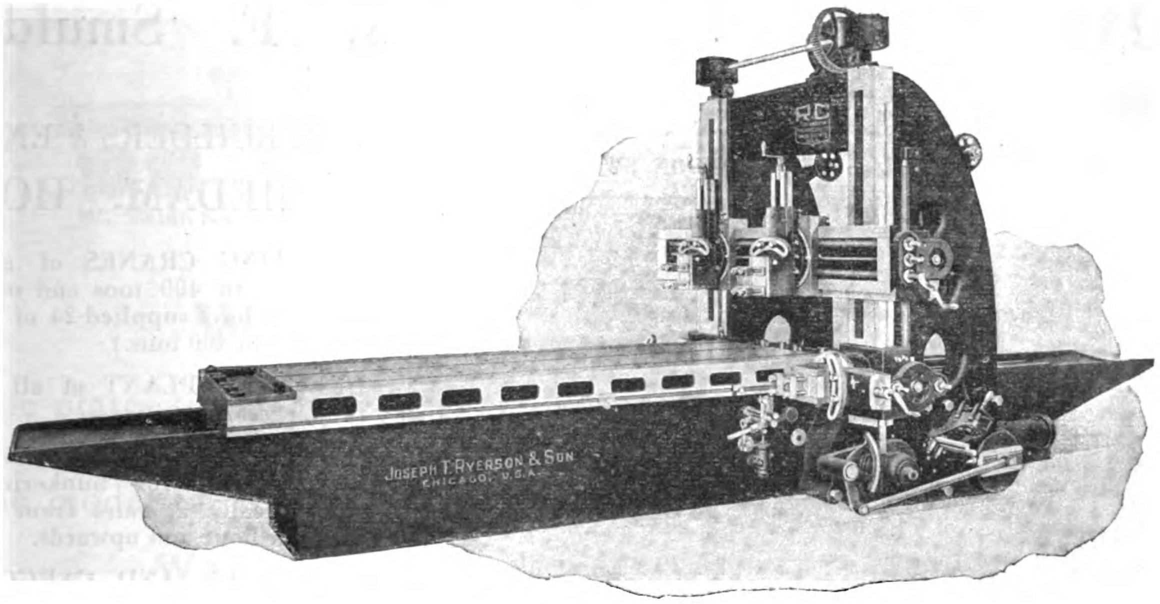
SHEWAN, TOMES & CO.

General Managers

St. George's Building HONGKONG.



Ryerson-Conradson Multispeed Planer

U. S. and Foreign Patents

The Ryerson-Conradson High Power Multispeed Planer presents a new type of machine, superior to any other type of planer in efficiency, durability, smoothness of operation and adaptability to motor drive. In designing this machine we have overcome the serious disadvantage of a reversing motor or shifting belts. We are manufacturing this planer in seven sizes, 24", 30", 36", 42", 48", 60", and 72" between housings with any length of table.

Special Features in the Design, Construction and Operation

Non-reversing constant speed motor drive (no belts).
No high speed reversing parts.
Four cutting speeds, constant quick return.
Herringbone gears, bull wheel and rack.
Self-compensating pneumatic clutches for reversing.
Pneumatic feeds.
Ways 15 degrees off horizontal, 15 degrees off vertical.

Separate motor for elevating cross rail.
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Side heads feed at any angle.
Aprons extended beyond maximum travel of table catch all surplus oil.
Considerable less power consumption, thereby reducing cost of operation.

We manufacture a complete line of machinery, comprising everything for the boiler, structural, bridge, railway, and general machine shop, such as Friction Saws, Punches, Shears, Riveters, Bending Rolls, Lathes, Planers, Shapers, Millers, Drill Presses, etc.

A bulletin on any particular machine or a complete catalogue on all Ryerson Machinery will be mailed at your request.

JOSEPH T. RYERSON & SON

ESTABLISHED 1842 INCORPORATED 1888

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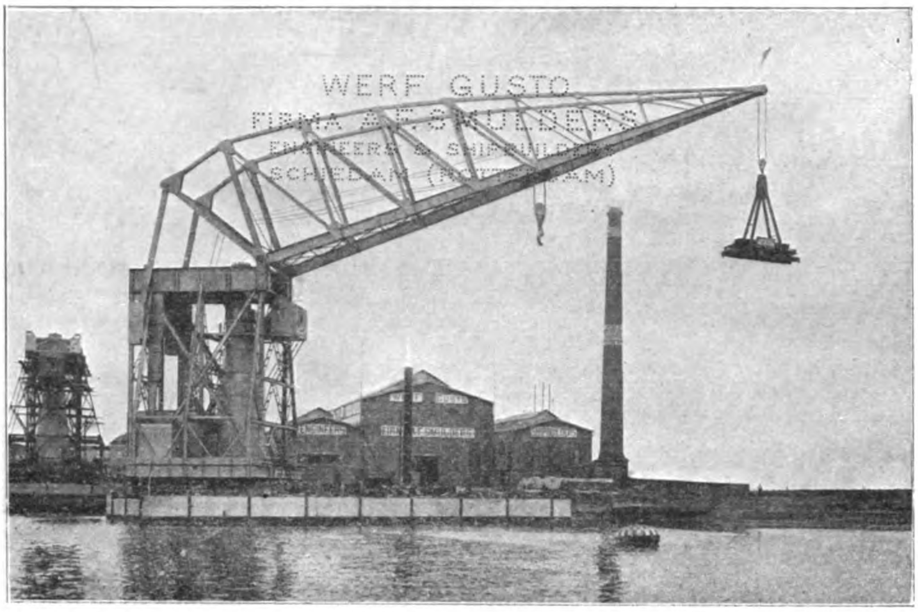

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BRIDGE, ROOF & CONSTRUCTIONAL STEEL WORK of every description by our own Boiler and Girder Works.

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n/c Liege, Belgium.

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Steel Plates. ________ Steel Castings.

STEWARTS AND LLOYDS, LTD.

GLASGOW BIRMINGHAM LONDON

SHANGHAI OFFICE: 6 KIUKIANG ROAD

FIRST in the Field—

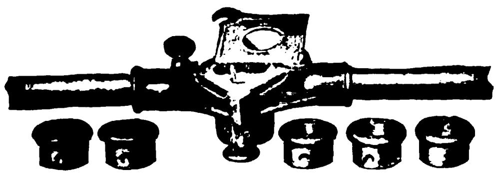

FIG. W4161. Nos. 0 to 1¼, without Leader Screw

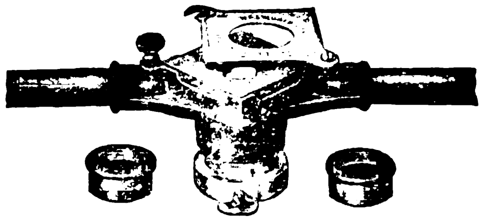

FIG. W4162. Nos. 2, 3, 4, with Leader Screw

WALWORTH DIE PLATES

Lack of die plates suitable for field work forced us in the early sixties to invent the Walworth Die Plate. It met with such a prompt and steady demand that it has remained the model for all die plates of this type.

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Oldest continuous manufacturers in the United States (since 1842) of a complete line of Valves, Fittings and Tools for steam, water, oil, gas, and air. Originators of the Famous "GENUINE WALWORTH STILLSON" Wrench and the "KEWANEE" Union.

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22 Kiukiang Road Shanghai, China

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MITSUBISHI KAIJO KASAI HOKEN
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Head Office:
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PAID-UP CAPITAL - - - „ 1,250.000

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25 Abchurch Lane, London, E.C. 4, England

BUSINESS ESTABLISHED IN 1814

NO OIL CAN CURE FRICTION TROUBLES. DO YOU KNOW WHY?

May be you've thought a shaft and a journal box were smooth. But—look at them through a magnifying glass.

They look like a file surface—and that's the sort of surfaces that are grinding one over another in all your bearings.

The rubbing of those rough surfaces is friction—and that friction makes bearings run hot and wear out. What are you doing to prevent it?

You're putting in oil—or may be grease—believing that it makes an oily, lubricating film between these rough surfaces. You're wrong.

The pressure in the bearing squeezes the soft oil or grease from between the points—the high spots—in the bearing surfaces. It's bound to—oil or grease hasn't body enough to stand the pressure.

The only safe lubricant—the only real lubricant—must have "body" enough, must be substantial enough, to withstand pressure. And with that "body" it must have high lubricating value.

What's the answer? Dixon's Flake Graphite—the unctuous, thin, tough, solid crystals of Ticondoroga graphite, white are too hard to squeeze out and yet oily enough to permit free, easy gliding over the smooth surface they form.

These fine flakes—mixed with oil or grease to carry them into the bearing—fill up and smooth out the roughness of the bearing surfaces and build a thin, solid veneer of unctuous graphite that can't be squeezed out, won't run out, won't burn out.

Then—instead of metal grinding on metal and wearing away—you have graphite gliding on graphite.

Then instead of wasting power to overcome bearing friction—you have more power available for useful work.

Do you get that? But don't think any kind of graphite will do—some graphites are only half-way lubricants. If you want to be sure—if you want to go the limit on this lubrication problem—Dixon Flake Graphite is the thing to remember and use.

GET SOME

And mix with your oil or grease as directed. Feed your lubricant as before—and watch results.

Send for the book—"A Study in Graphite" No. 185-C.

Made in Jersey City, N.J. by the

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Established 1827

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The ordinary so-called safety valve which sticks or binds or does not blow off fast enough to take care of rapid evaporation, is not a safety valve, but a positive menace.

If some emergency in your plant obliges you to cut off a steam line, and your pressure begins to rise to the danger point, can you rely on the "safety" valve that you now have?

With Consolidateds, all doubt is removed—they meet, with a wide margin, all the requirements of safety. Each valve has stamped on it in pounds, the capacity, popping and closing pressures. Connections made according to British or Metric practice.

Our agent is prepared to quote prices on Ashcroft Gauges and Metropolitan Injectors, as well as Consolidated Safety Valves.

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New York

Henry Katten, 22 Kiukiang Road, Shanghai, China

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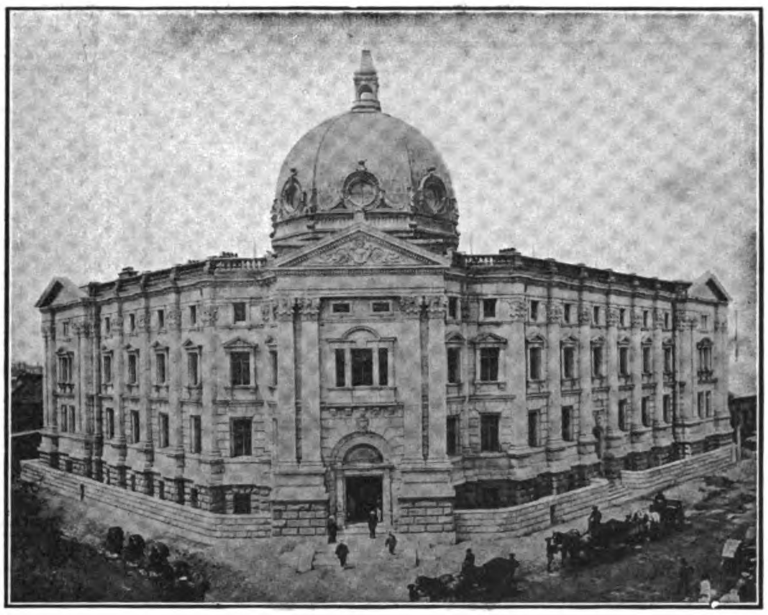

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THE FAR EASTERN REVIEW

ENGINEERING FINANCE COMMERCE

上海仁記路第五號

遠東時報

THE PACIFIC CONFERENCE

CHINA'S VICTORY

Japan's Brilliant Come-Back

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SHANGHAI
NEWCHWANG
SINGAPORE
RANGOON

FORMOSAN SUGAR INDUSTRY

INDO-CHINA RAILWAYS

N. E. I. RAILWAYS

KOREAN INDUSTRIES

Vol. XVIII February, 1922 No. 2

A.L.TAYLER.

SHANGHAI, PEKING, TOKYO AND MANILA

FURTHER BIG REDUCTIONS

DENNIS

COMMERCIAL MOTORS

Practically back to Pre-War Prices

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2-2½-ton Standard Lorry Chassis...	**£730**	£ 997	***£267***
2-2½-ton Long Char-a-bane Chassis	**£750**	£1,007	***£257***
3½-4-ton Lorry Chassis	**£865**	£1,195	***£330***
3½-4-ton Char-a-bane Chassis ...	**£880**	£1,190	***£310***
4-ton Long Wheelbase Omnibus Chassis	**£950**	£1,200	***£350***
5-6-ton Lorry Chassis	**£960**	£1,320	***£370***

The prices given above are F.O.B. Guildford, England

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Purchasers of "DENNIS" vehicles, even at such low prices, can feel perfectly assured that they are acquiring absolutely new goods of latest and most improved construction, as Dennis Brothers have never purchased or taken back second-hand War Lorries. The Vehicles we are offering are absolutely new and embody improvements on previous models. We have been able to keep our factory busy on new productions, and are not selling Chassis made two to six years ago and re-purchased from the Government, nor are we offering re-conditioned War Chassis.

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Cables: A.B.C. 5th Edition, Lieber's, Bentley's, Marconi.

DENNIS BROS., LTD.

GUILDFORD, ENGLAND

D 221

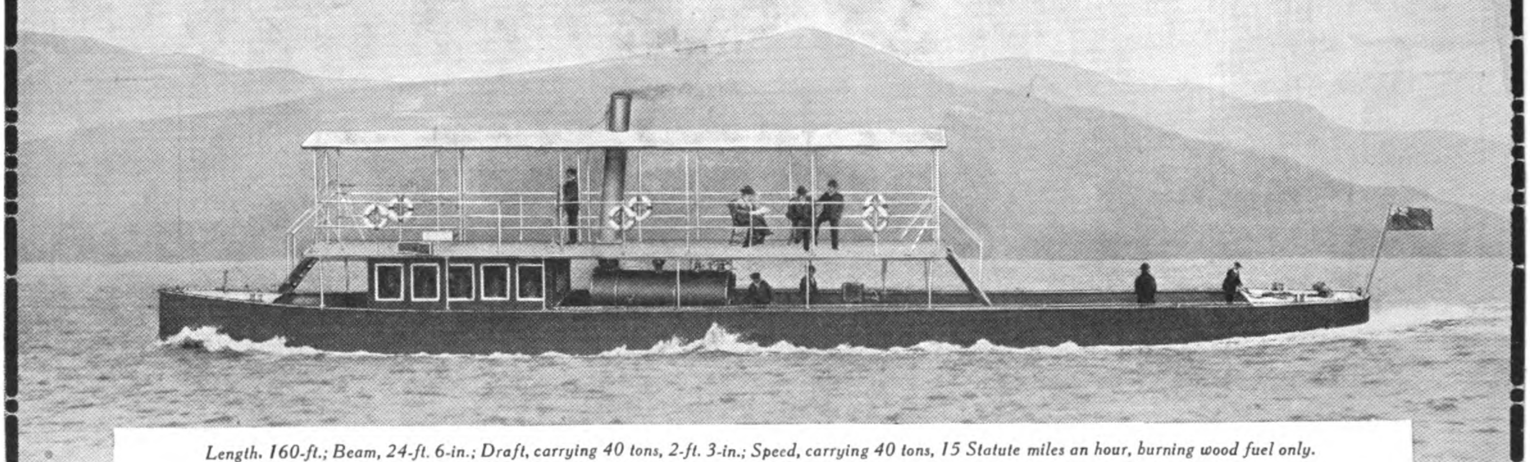
SHALLOW DRAUGHT LAUNCH—YARROW SYSTEM,

built by

YARROW & CO., L^{TD}, Glasgow,

(formerly of Poplar, London).

Yarrows, Limited, of Victoria, British Columbia, Shipbuilders, Ship Repairers and Engineers, are associated with Yarrow & Co., Ltd., Glasgow.



Length, 160-ft.; Beam, 24-ft. 6-in.; Draft, carrying 40 tons, 2-ft. 3-in.; Speed, carrying 40 tons, 15 Statute miles an hour, burning wood fuel only.

Vessel as above illustrated can be shipped whole to any part of the world.

Messrs. YARROW Construct Fast Passenger and Commercial Vessels, Shallow Draught Steamers, Tugs, etc., propelled by Sternwheels, Side Wheels, or Screws working in Tunnels fitted with Yarrow's Patent Balanced Hinge Flap.

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FOUNDED, 1904

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VOL. XVIII FEBRUARY, 1922 NO. 2

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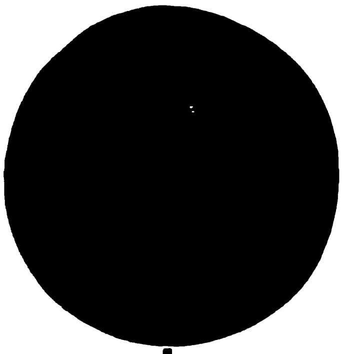

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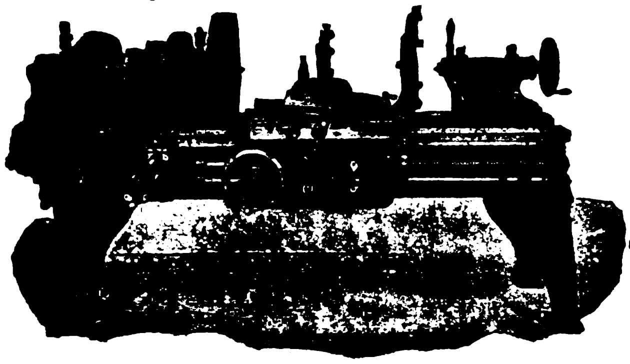

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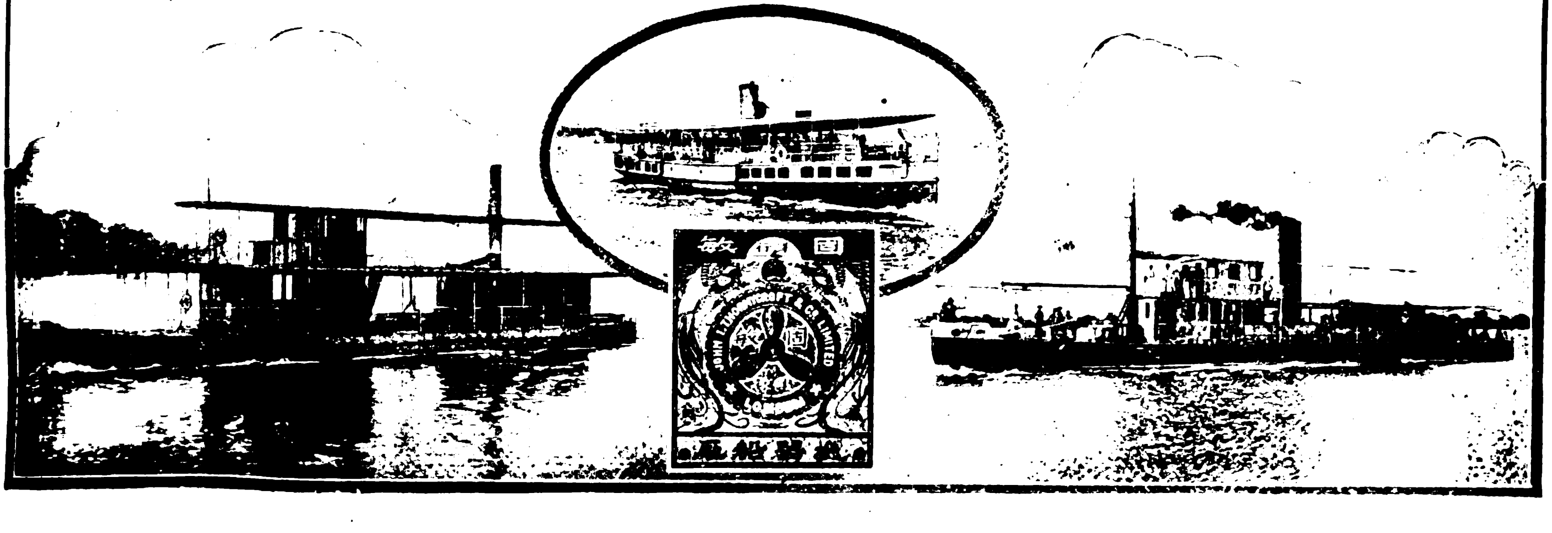

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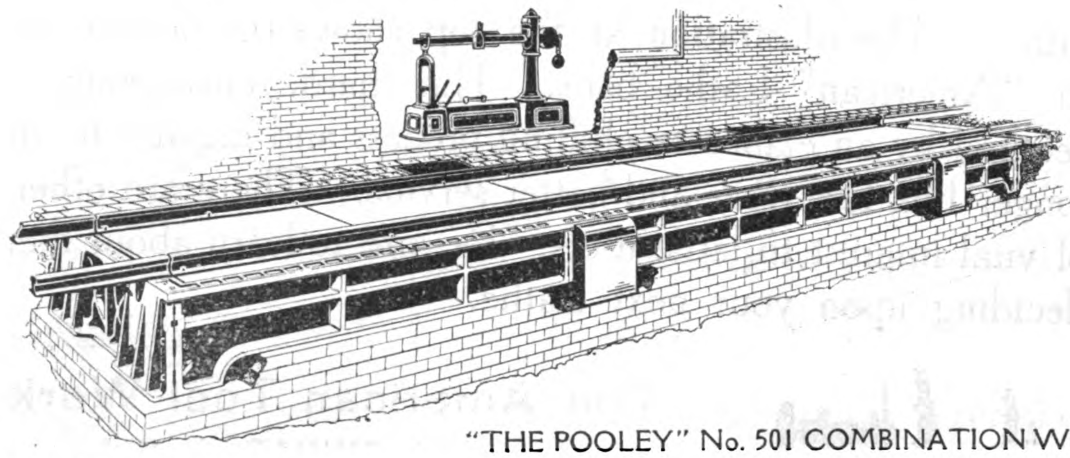

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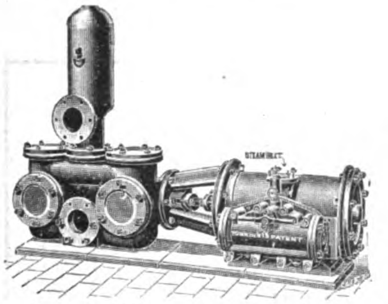

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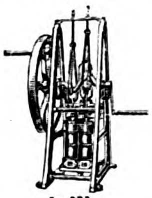
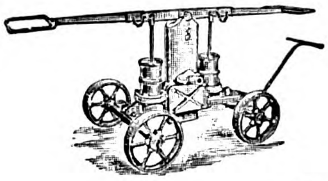
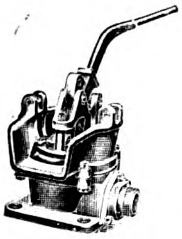
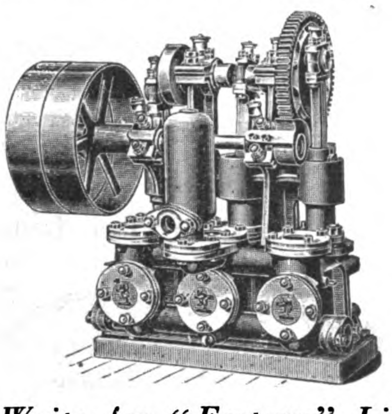


Fig. 228.

Fig. 160.







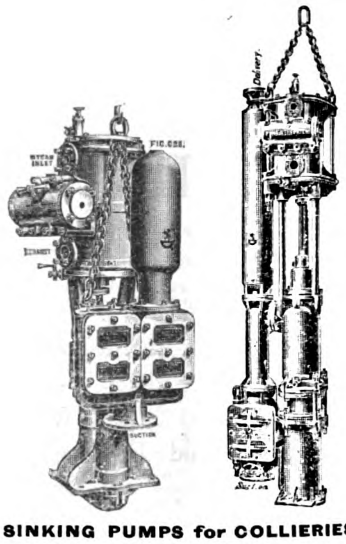


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Fig. 191.

Fig. 185.

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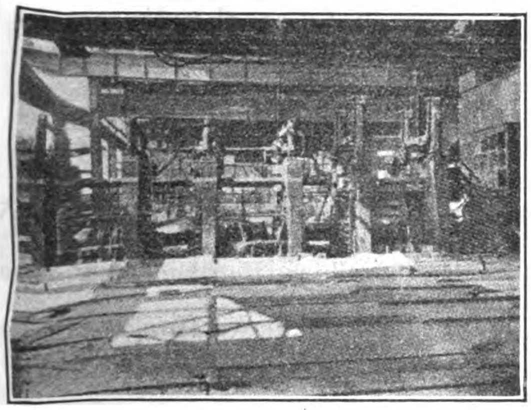

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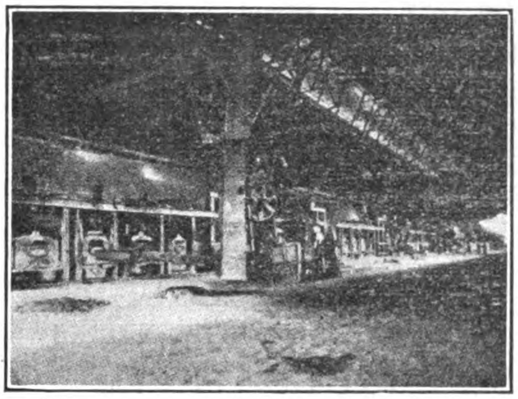

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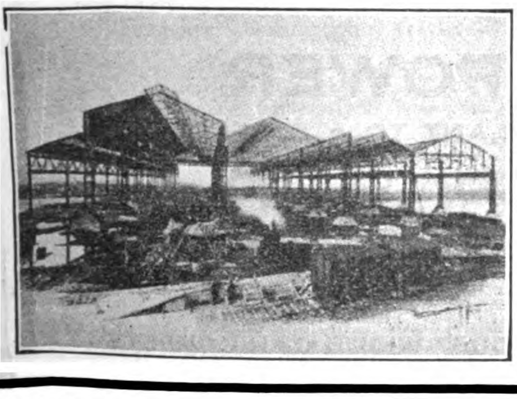

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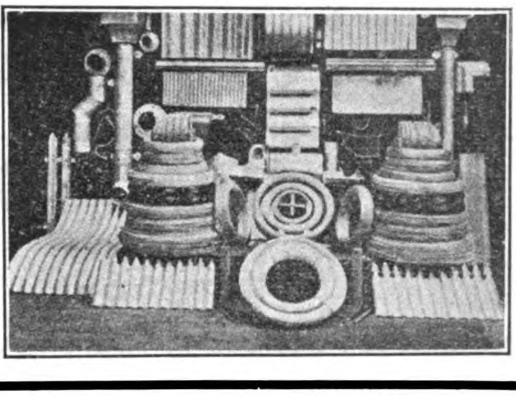

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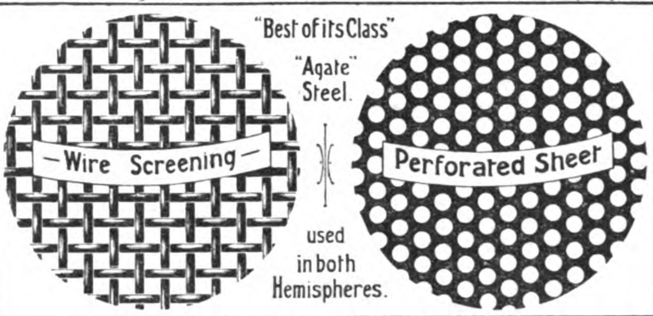

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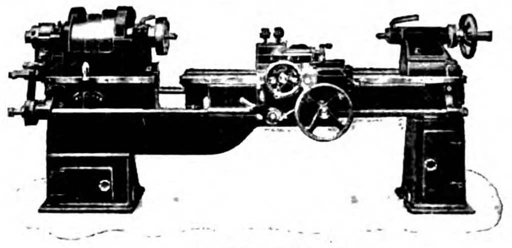

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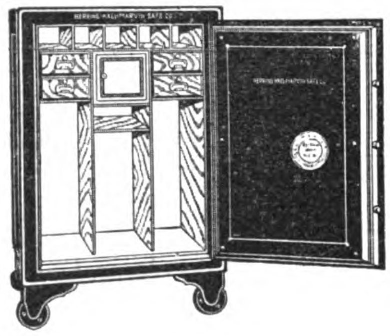

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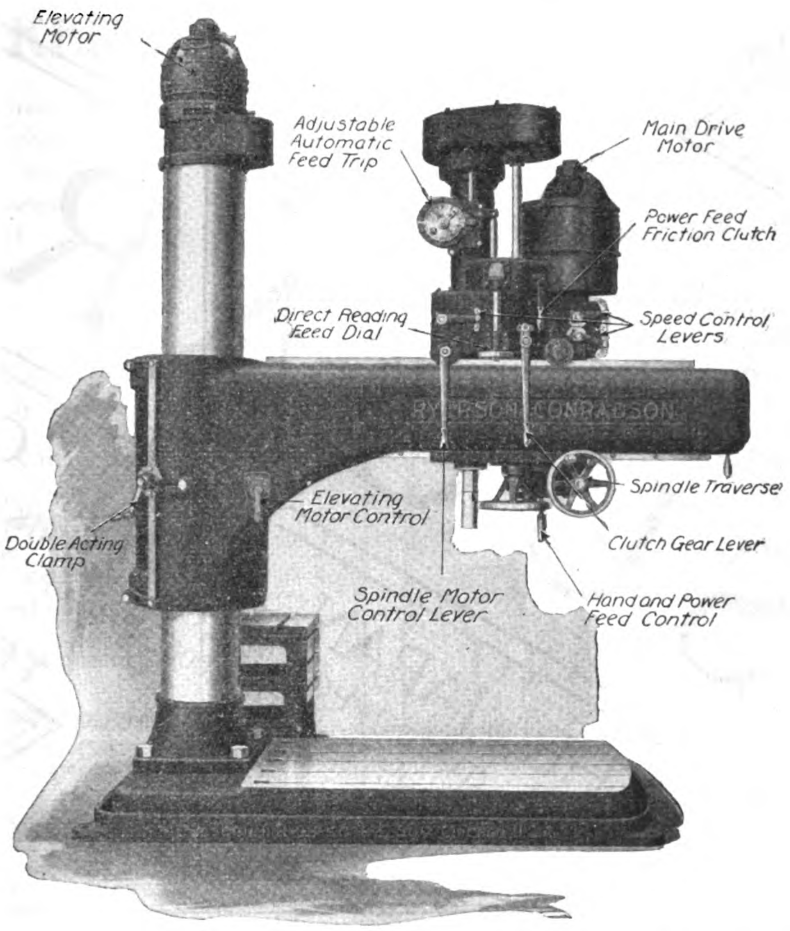

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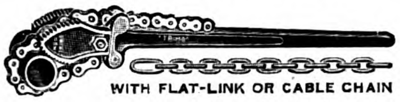

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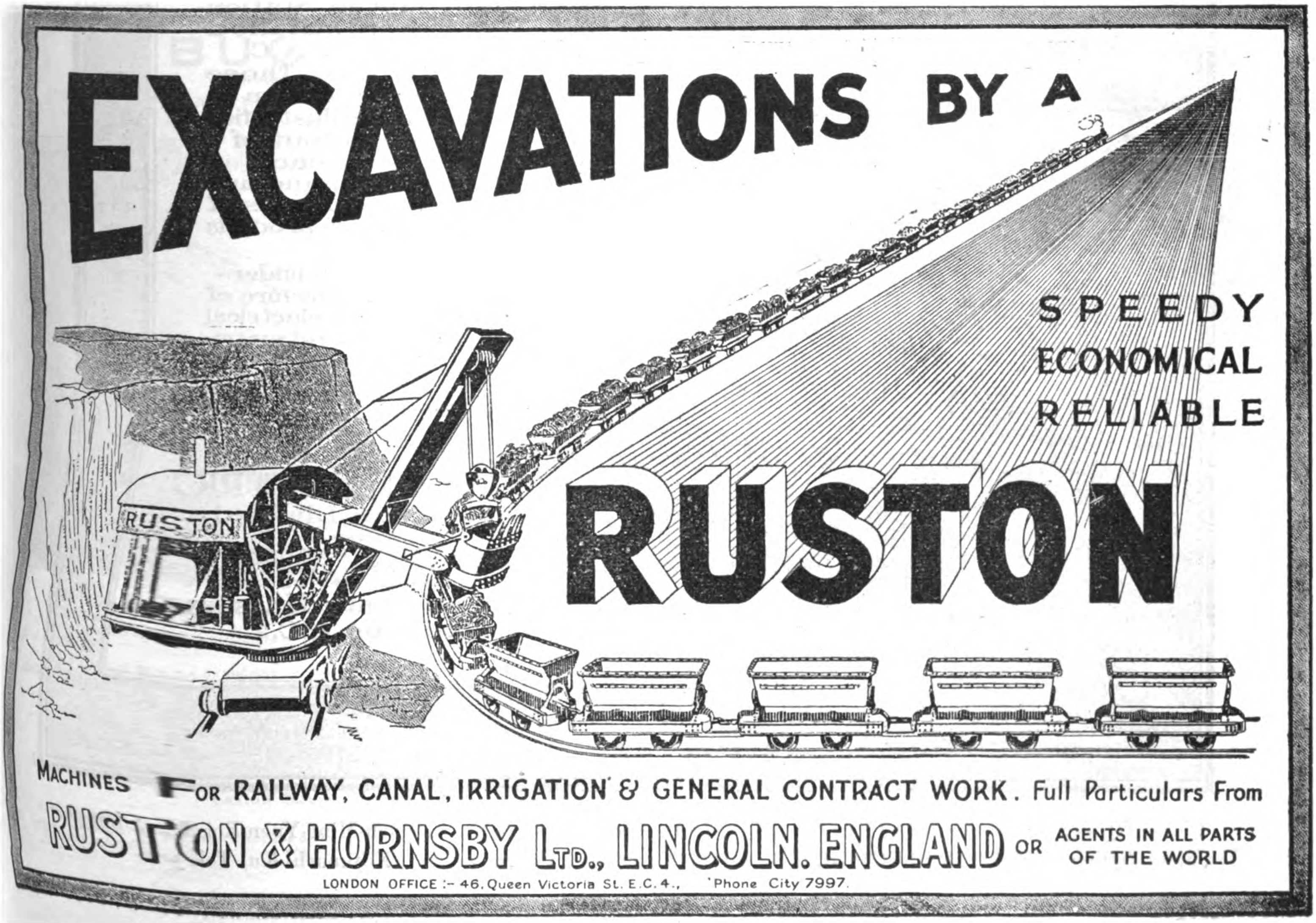

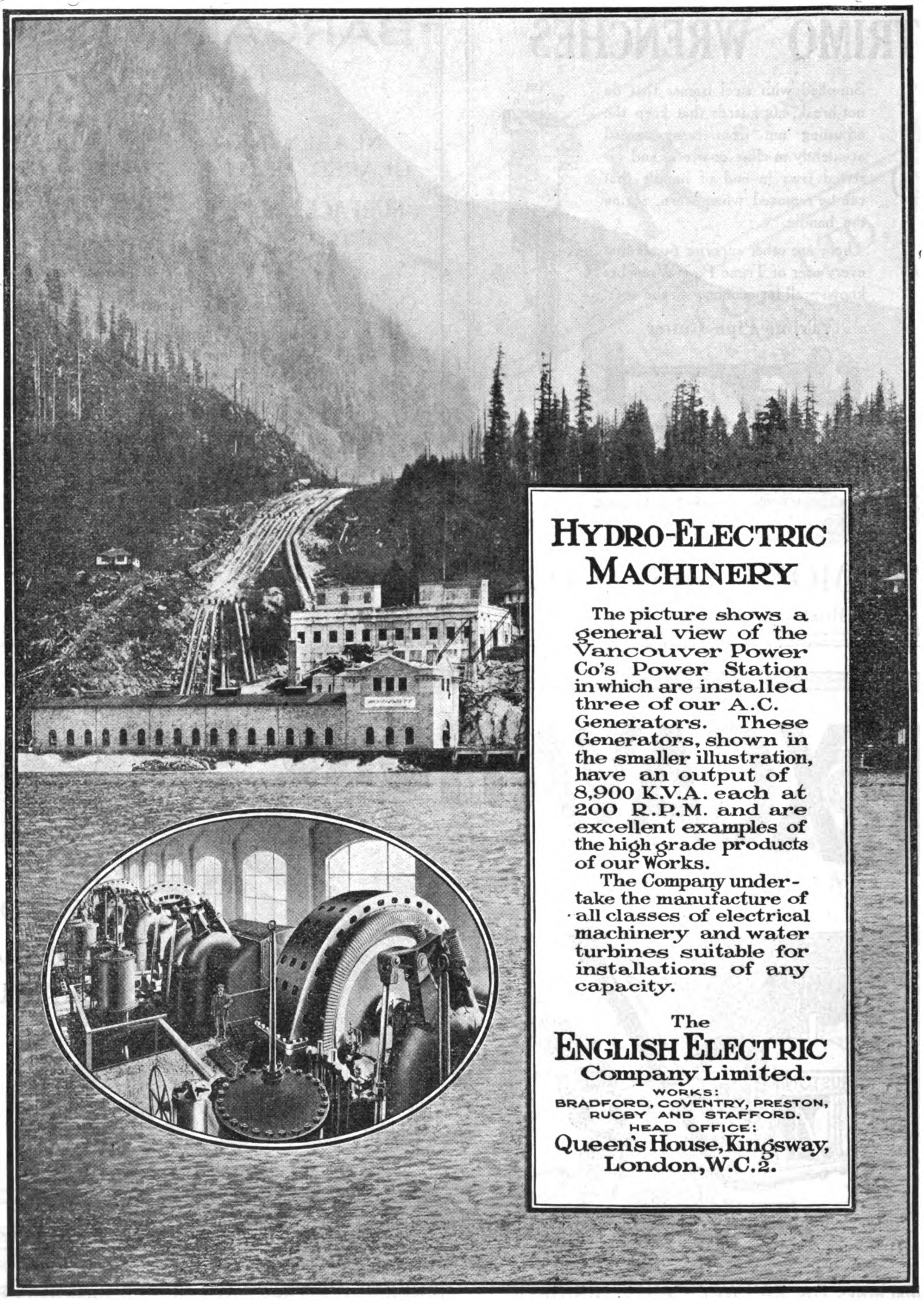

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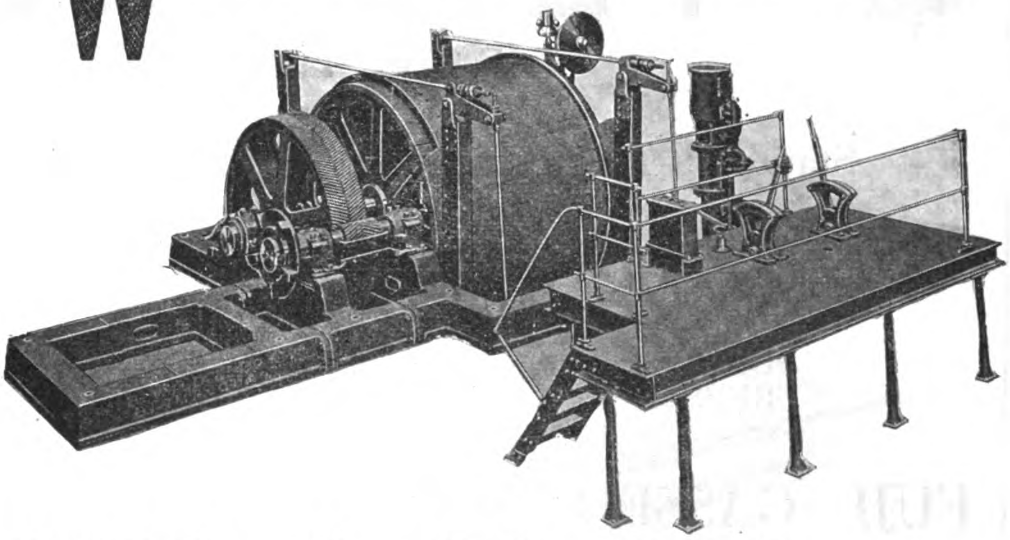

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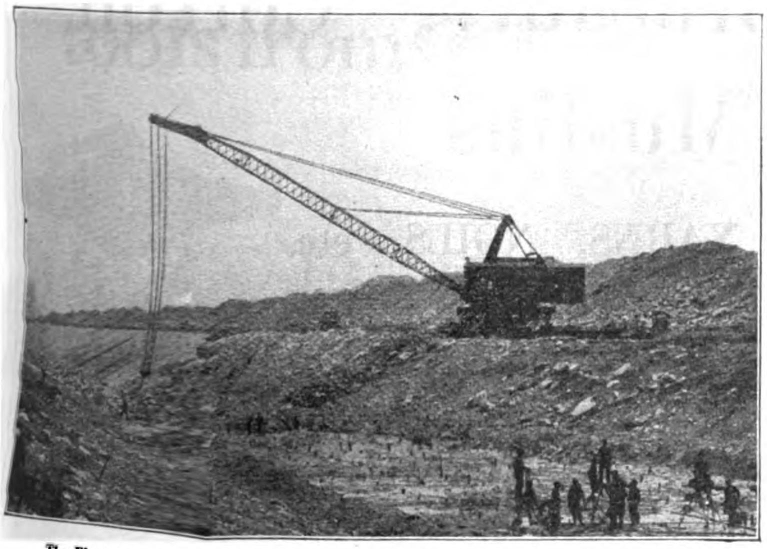

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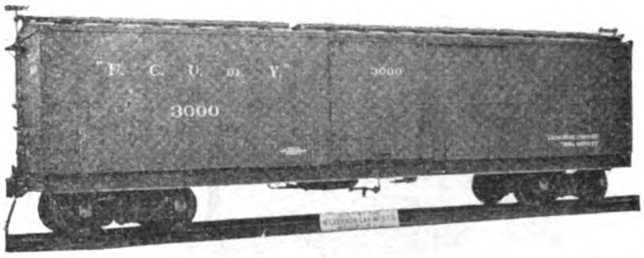

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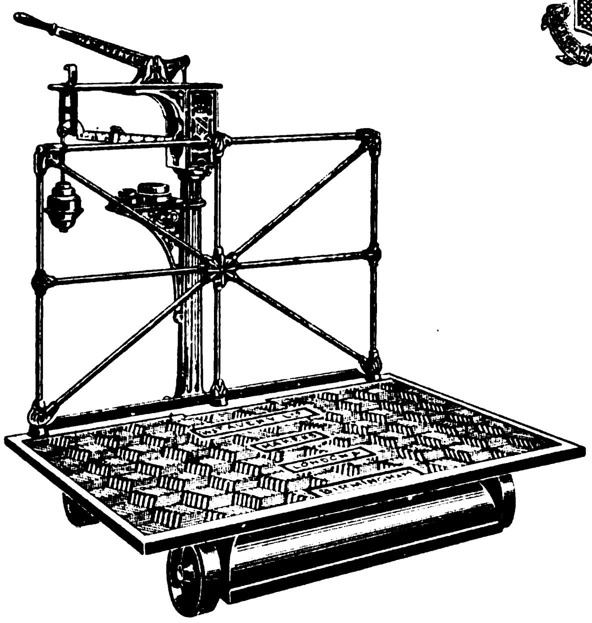

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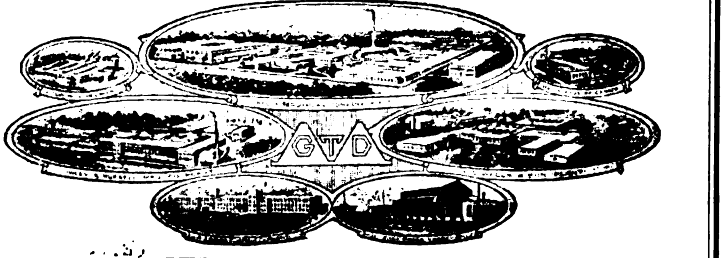

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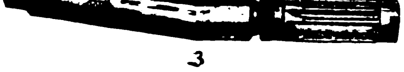
1

2



3

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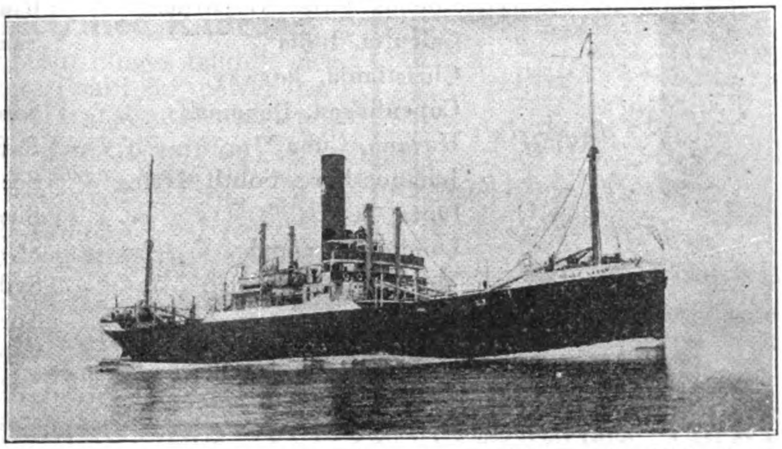

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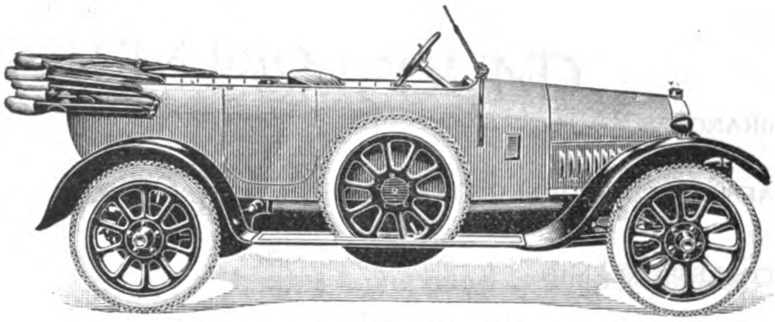

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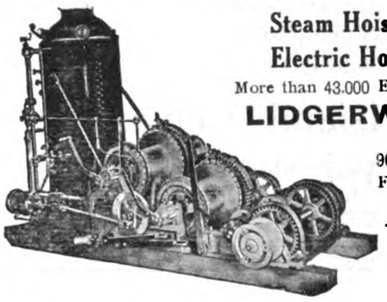

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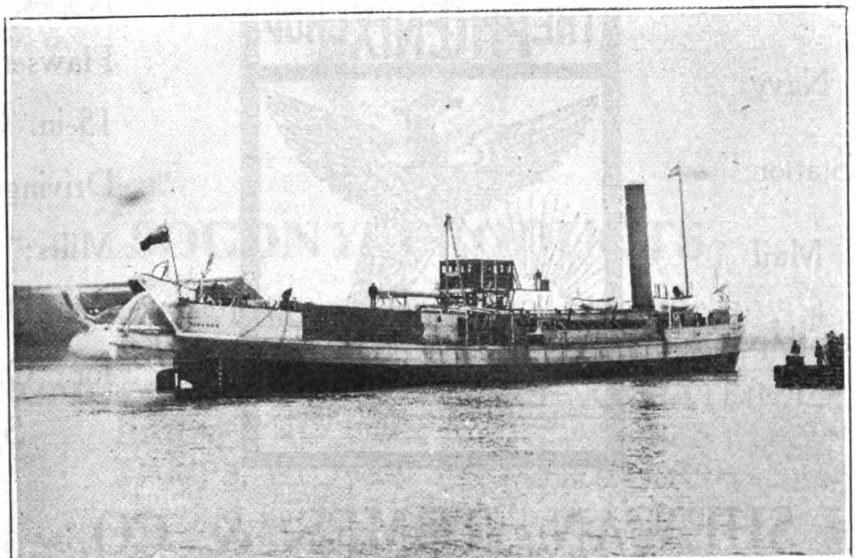

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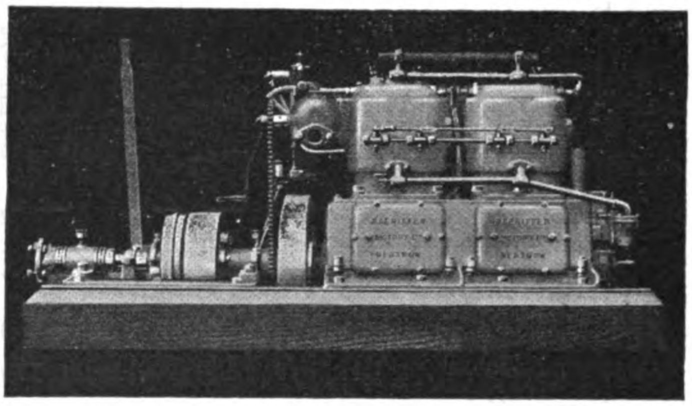

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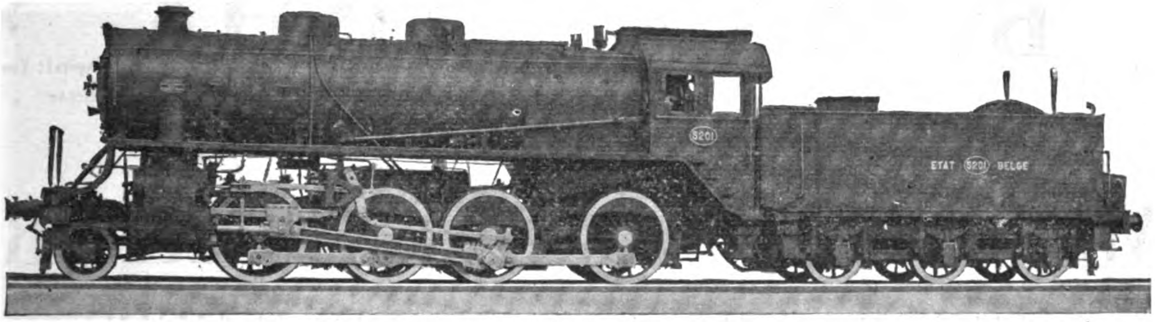

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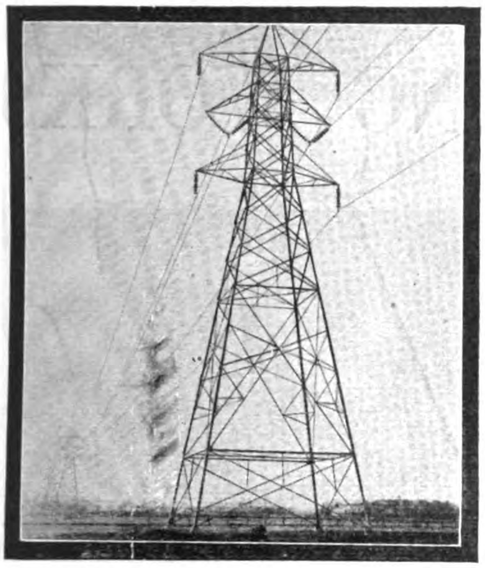

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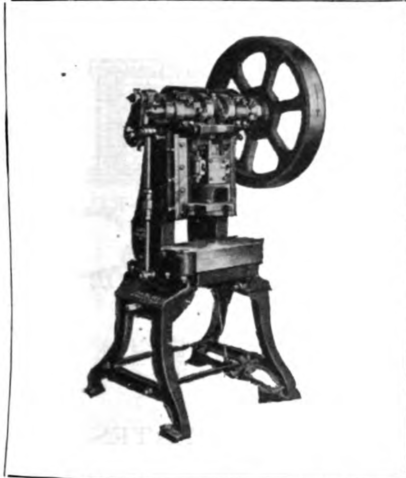

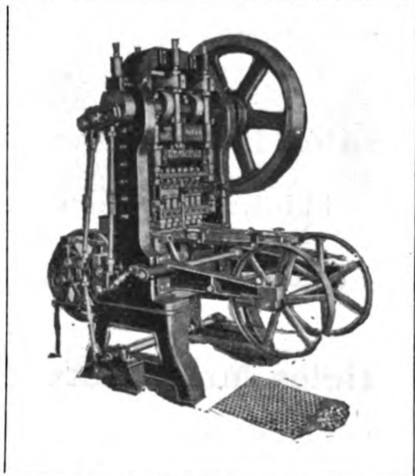

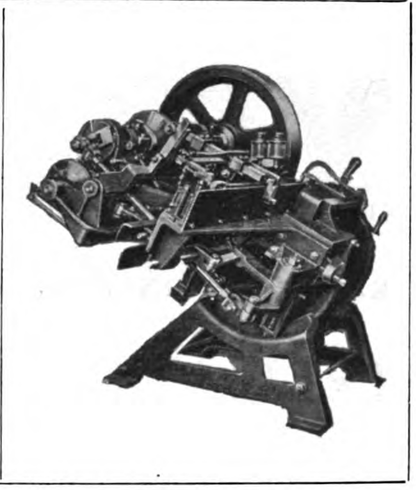

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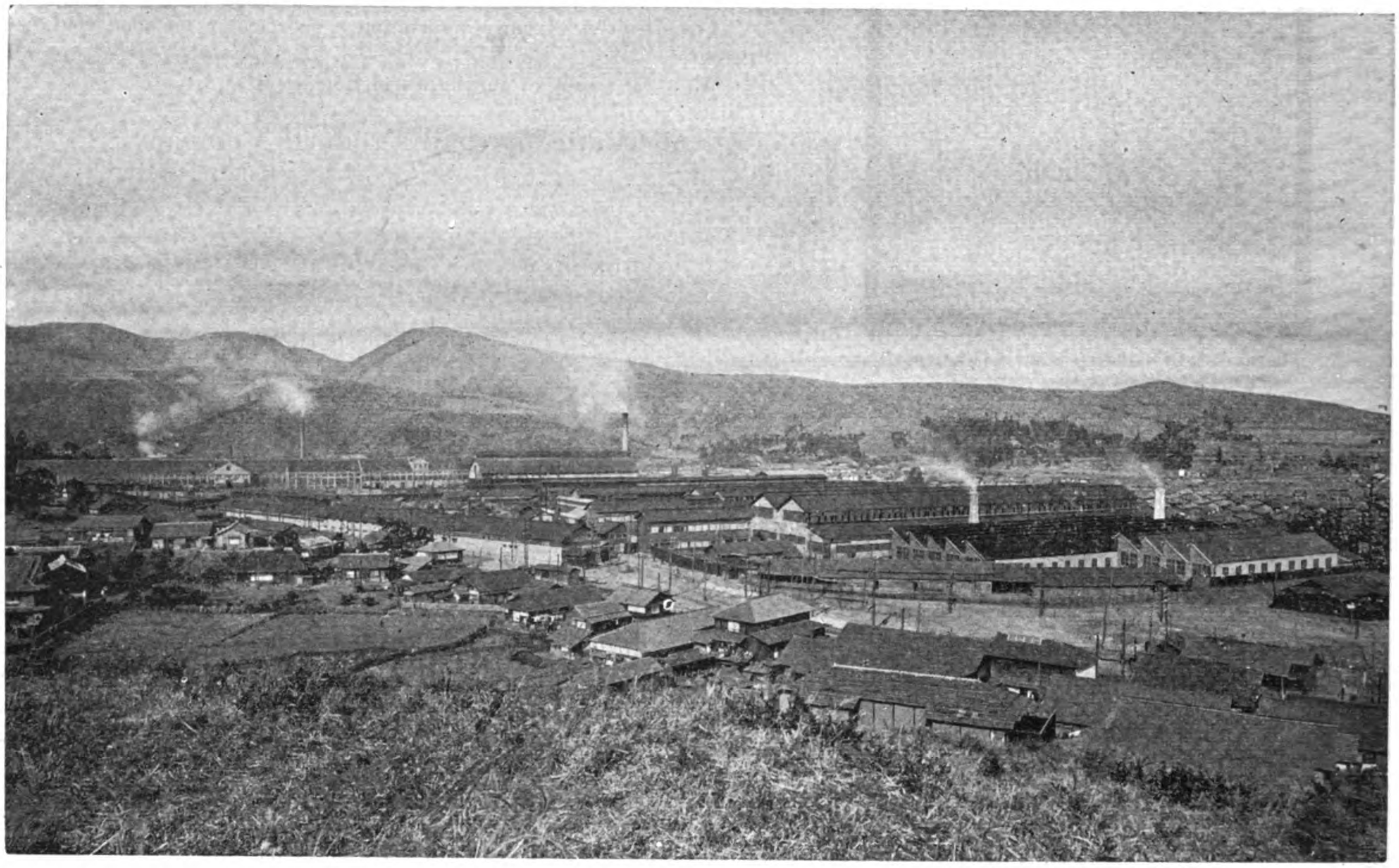

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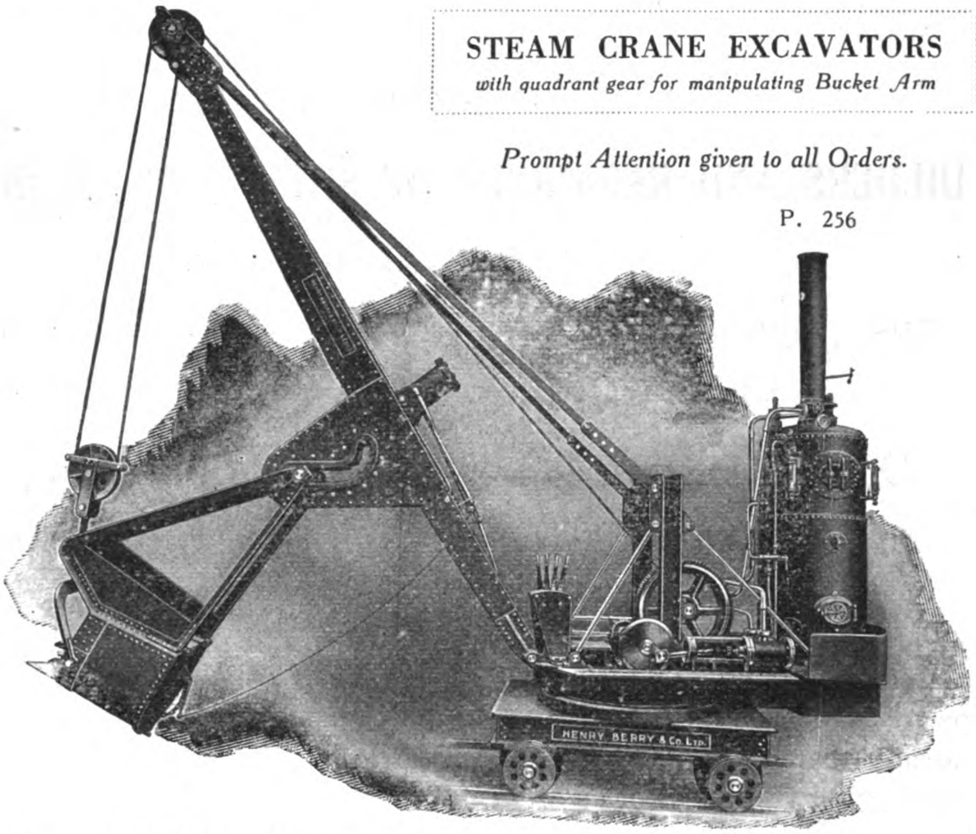

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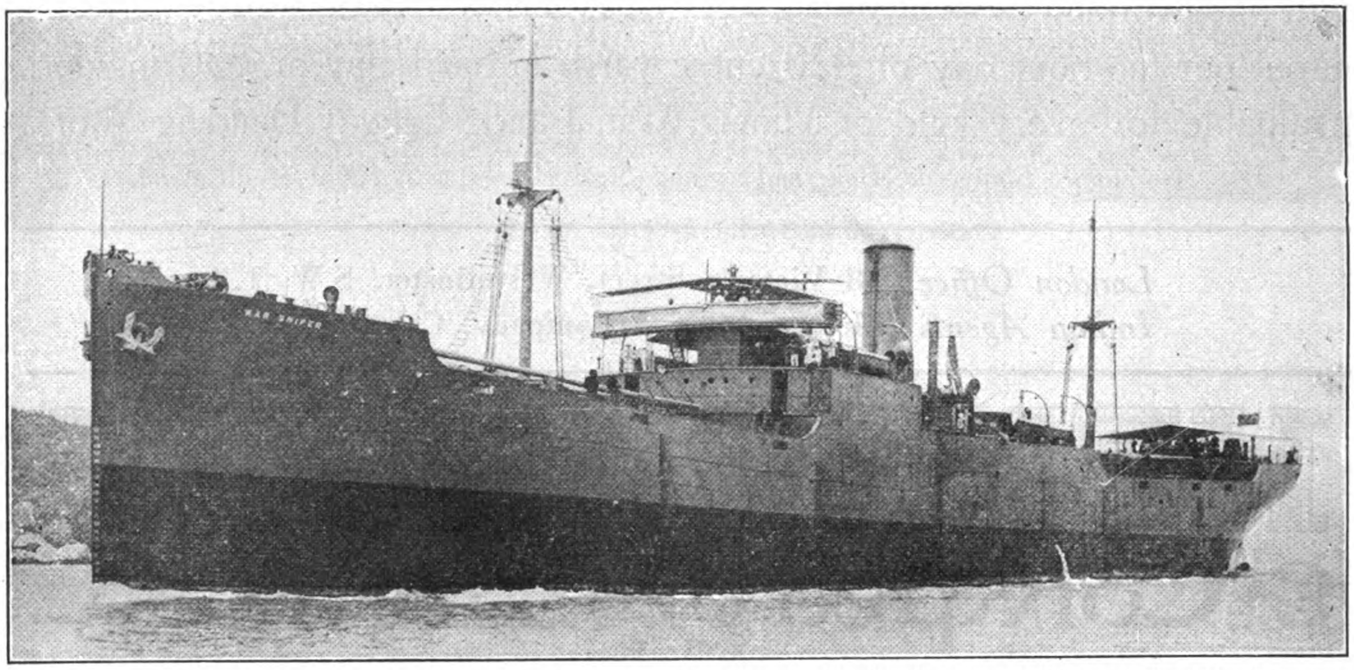

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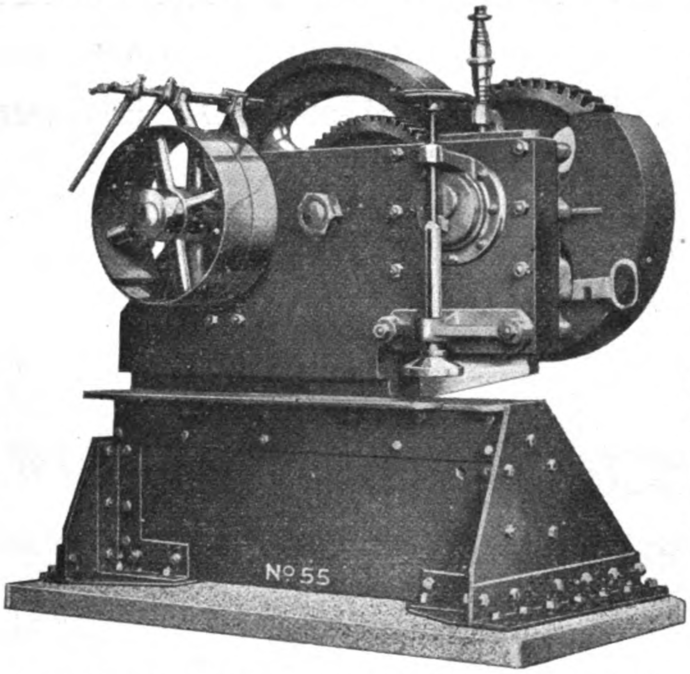

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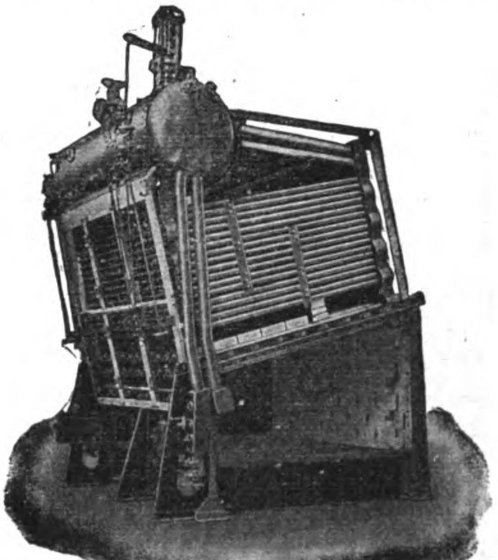

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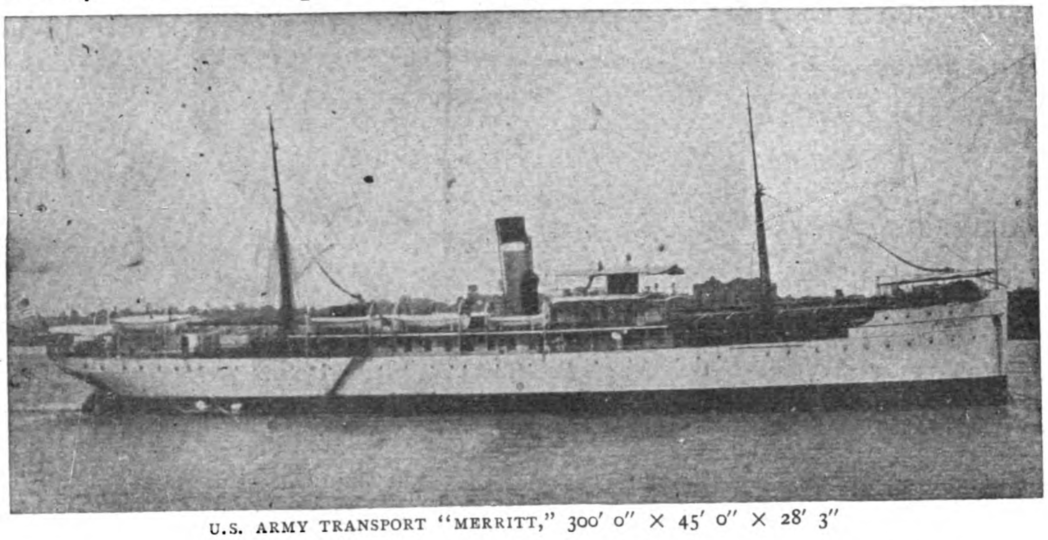

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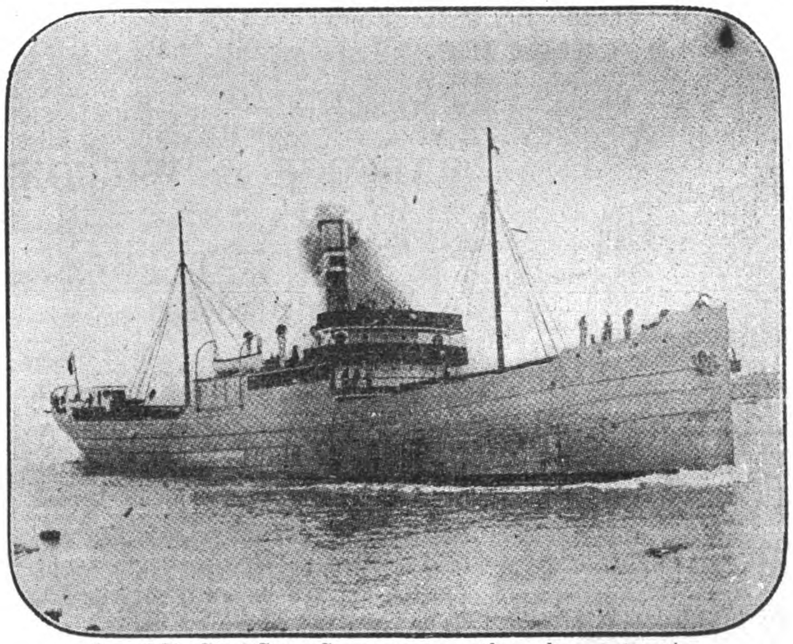

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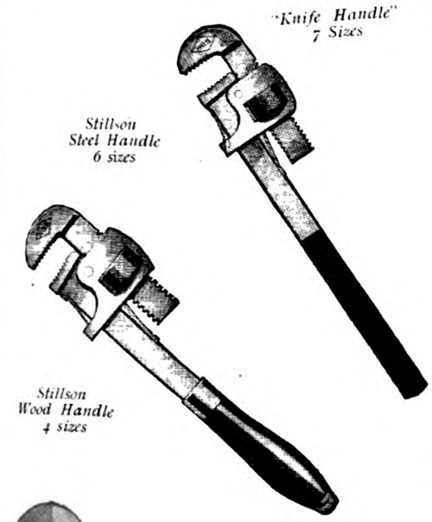

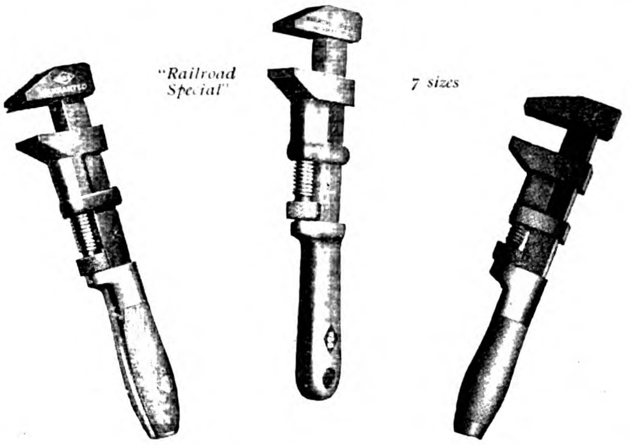

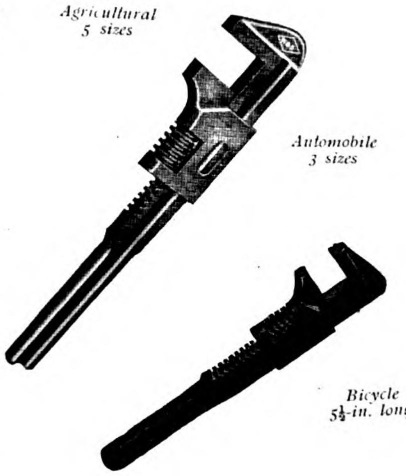

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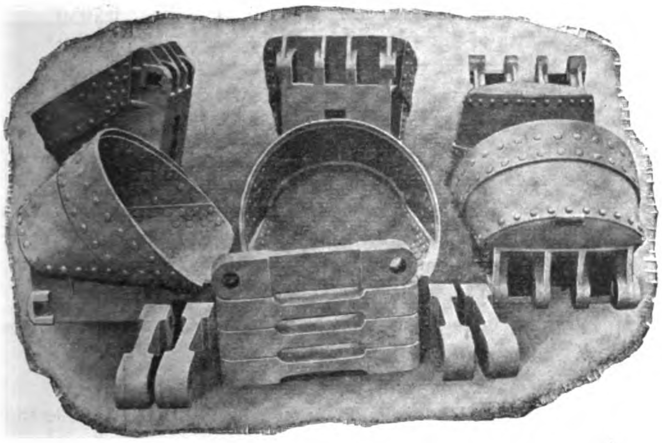
Export Office: 124 State St., New York, U.S.A.
London Representative: Benj. Whittaker, Ltd. Dept. K, 56 Ludgate Hill, E. C. 4.
General Offices: 124 Richards St., Brooklyn, N. Y., U. S. A.



"Imperial" Manganese Steel

"Imperial" Manganese Steel, whether used for the lips of dredger buckets, the bucket chain links, pins or bushes, means fewer stoppages due to breakage or rapid wear. As an example, the following extract from a letter may be quoted: "Up to the time I left West Africa the three bucket dredgers (gold dredging)

did not break a pin.

One dredge has been at work nearly two years, and the other two six months. I think the wear of the pins consitutes a record." What would a record like that mean to you in money saved?

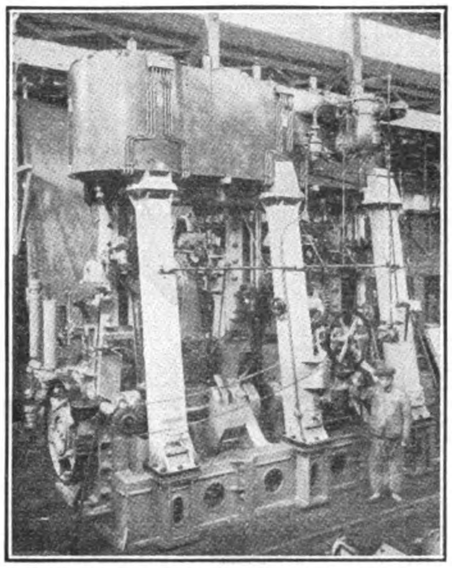
The Makers of "Imperial" Manganese Steel

are

CHINA
Agents:
JARDINE, MATHESON & CO., LTD.
8a Yuen-ming-yuen Rd., Shanghai
and at
Hongkong, Hankow, Tientsin, Peking, Etc.

Edgar Allen & Co. Ltd
Imperial Steel Works
Sheffield

JAPAN
Branch Office:
EDGAR ALLEN & CO., LTD.
2 Mitsu Bishi Buildings,
1 Yaesu-Cho, Kojimachi Ku,
TOKYO



Set of Triple Expansion Engines for Cargo Steamer

THE NEW ENGINEERING & SHIPBUILDING WORKS LTD.

SHANGHAI, CHINA Cable Address: "SPEEDY"

ENGINEERS, BOILERMAKERS, ELECTRICIANS, FOUNDERS, WELDERS, SALVAGE EXPERTS

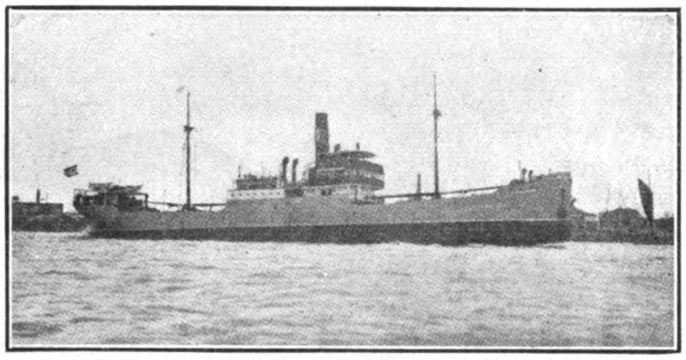
COMPOUND AND TRIPLE EXPANSION ENGINES for marine and stationary purposes.

MARINE MOTOR ENGINES for Petrol, Gasolene, Kerosene or Paraffin.

CONDENSING PLANTS, PUMPS, HOISTING ENGINES, etc.

STEEL STRUCTURAL WORK, BRIDGE GIRDERS AND ROOF TRUSSES

CYLINDRICAL MULTITUBULAR BOILERS, CORNISH and LANCASHIRE BOILERS, VERTICAL BOILERS.



S.S. "Halvdan," one of 8 Steamers Built and Engined at Works

SHIPBUILDERS

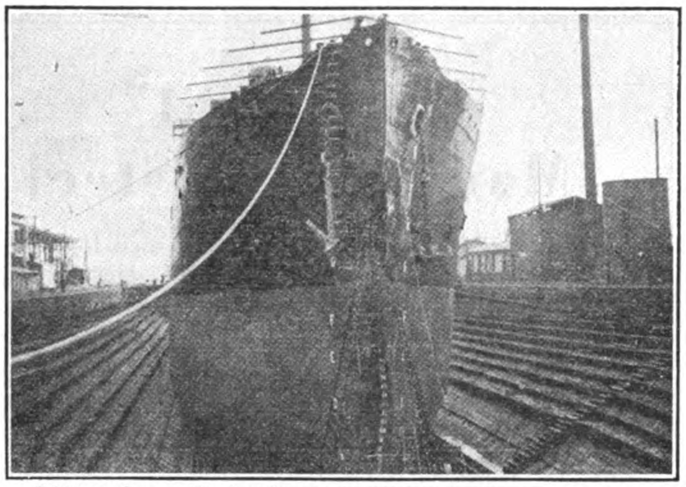
Ocean and River Craft Oil Carriers

Auxiliary Schooners

Shallow Draft Passenger and Cargo Vessels

Steam or Motor Driven

Steel, Wood or Composite built.



7,000-ton Steamer Docked for Repairs of Damage Sustained in Collision

DOCK PROPRIETORS

Yangtszepoo Dock

Length	577′-0″
Entrance	70′-0″
Width of Sill	60′-0″
Depth on Sill	20′-0″

Patent Slips

for vessels up to 200-ft. long

Vessels docked promptly

General Repairs, Annual Overhauls and Re-classification Work executed efficiently and expeditiously under European Supervision.

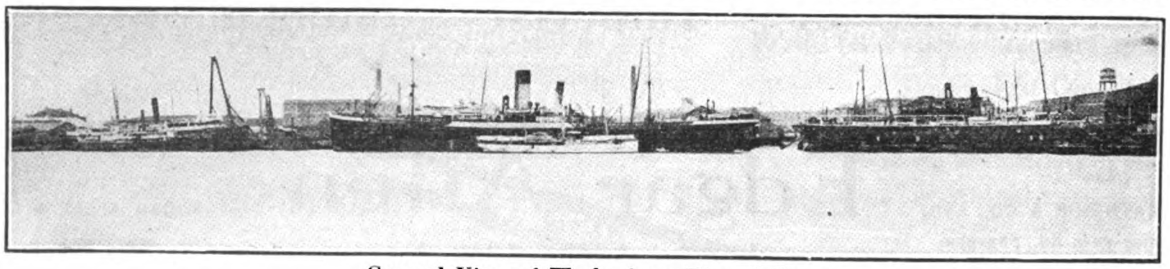
Moderate Charges

Vessels undergoing repairs accommodated at wharves alongside Works.

The Works are equipped with the latest Machine Tools, Electric Drills, Pneumatic and Hydraulic Plant and Tools, Quasi-Arc Electric Welding and Oxy-Acetylene Welding, Galvanizing Plant.

Salvage Experts, Divers and a comprehensive Salvage Plant. Floating Cranes to lift 50 tons and Sheerlegs to lift 80 tons.

THE PROPERTY OF THE COMPANY COVERS AN AREA OF ABOUT 40 ACRES with a RIVER FRONTAGE of 1,800-ft.



General View of Works from River Side

Showing 8 Steamers Berthed Alongside Undergoing Repairs.

Cable Address:
"DOCKYARD" KOBE
"DOCK" DAIREN

A1, A.B.C. (4th and 5th),
Engineering, Scott's, Lieber's
Bentley's
and
Western Union Codes Used

KAWASAKI DOCKYARD CO., LIMITED

CONTRACTORS TO THE IMPERIAL JAPANESE ARMY AND NAVY AND TO FOREIGN GOVERNMENTS

KOBE

ESTABLISHED 1870

STEEL MAKERS, SHIP-OWNERS, LOCOMOTIVE BUILDERS, SHIPBUILDERS, ENGINEERS AND REPAIRERS

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Dockyard & Engineering Works

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Steel Foundry, Bar Mill and Railway Shops

FUKIAI, KOBE
Plate Mill

BUILDERS OF

BATTLESHIPS, CRUISERS, TORPEDO-BOATS, DESTROYERS, SUBMARINES

ALSO, BUILDERS OF

FIRST-CLASS HIGH-SPEED OCEAN STEAMERS OF THE LARGEST SIZE AND POWER

Sino-North American Co., Ltd.

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New York Office: 1330-1336 WOOLWORTH BUILDING

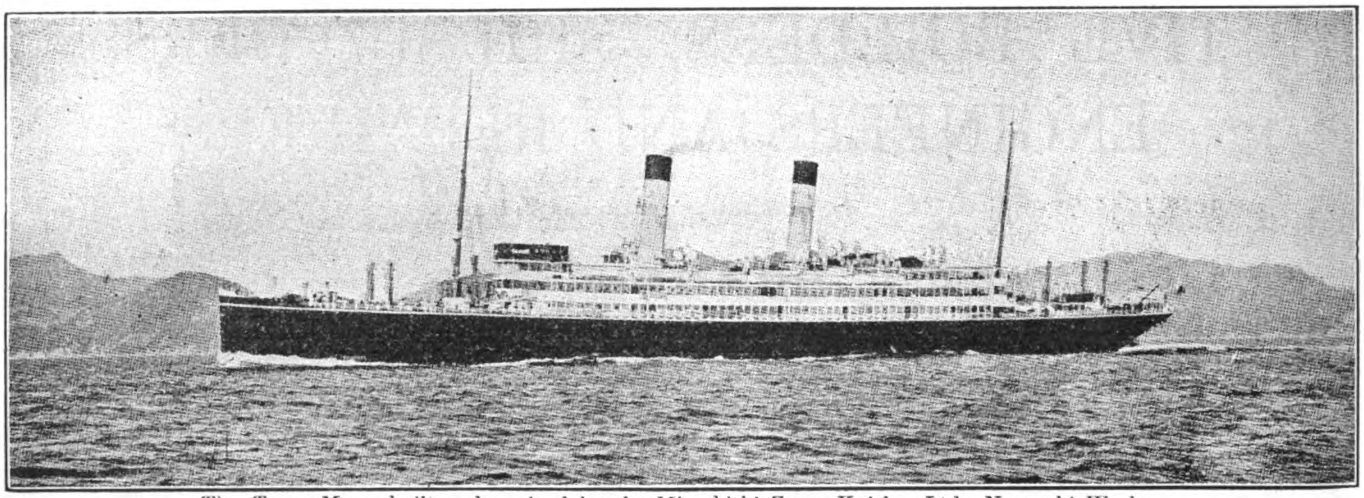
IMPORTERS, EXPORTERS, ENGINEERS & CONTRACTORS

BRANCHES and AGENCIES

San Francisco, California; Cincinnati, Ohio; Vancouver, B.C.; Calcutta, India; Shanghai, China; Kobe, Japan; Vladivostok, Siberia

Cable Address: SINAM, NEW YORK

G. M. GEST, Managing Director



The *Tenyo Maru*, built and engined by the Mitsubishi Zosen Kaisha, Ltd., Nagasaki Works

MITSUBISHI ZOSEN KAISHA, LTD., NAGASAKI WORKS

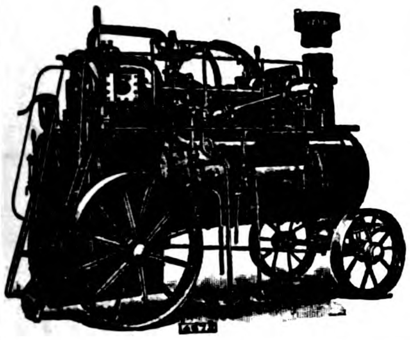
(ex Mitsubishi Dockyard & Engine Works, Nagasaki)

	DOCK No. 1		DOCK No. 2		DOCK No. 3	
Extreme Length	523	Ft.	371	Ft.	728.9	Ft.
Length on Blocks	513	,,	350	,,	714	,,
Width of Entrance on Top	89	,,	66	,,	99½	,,
,, ,, ,, ,, Bottom	77	,,	53	,,	88½	,,
Water on Blocks at Spring Tide	26½	,,	24	,,	34½	,,

THE BEST EQUIPPED SHIPBUILDING PLANT IN THE FAR EAST

With Special Facilities for Handling the Heaviest Castings and the Repairing or Building of Ships, Engines, and Boilers
Also Electrical Work

LARGE STOCK OF MATERIAL AND FITTINGS ALWAYS ON HAND

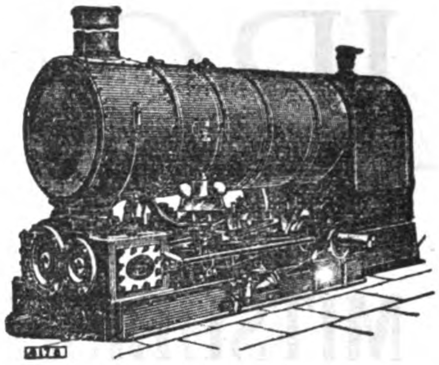


Engines & Boilers

FOR ALL PURPOSES

Ransomes, Sims & Jefferies, Ltd.

IPSWICH, ENGLAND



PORTABLE AND TRACTION STEAM ENGINES, STATIONARY ENGINES, VERTICAL ENGINES, BOILERS OF ALL KINDS, OIL TRACTORS, OIL ENGINES, ELECTRIC ENGINES, MINING MACHINERY.

AGRICULTURAL MACHINERY

STOCKS KEPT IN TIENTSIN

AGENTS:

J. WHITTALL & CO., LTD.

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14, 16 & 18 VICTORIA TERRACE,
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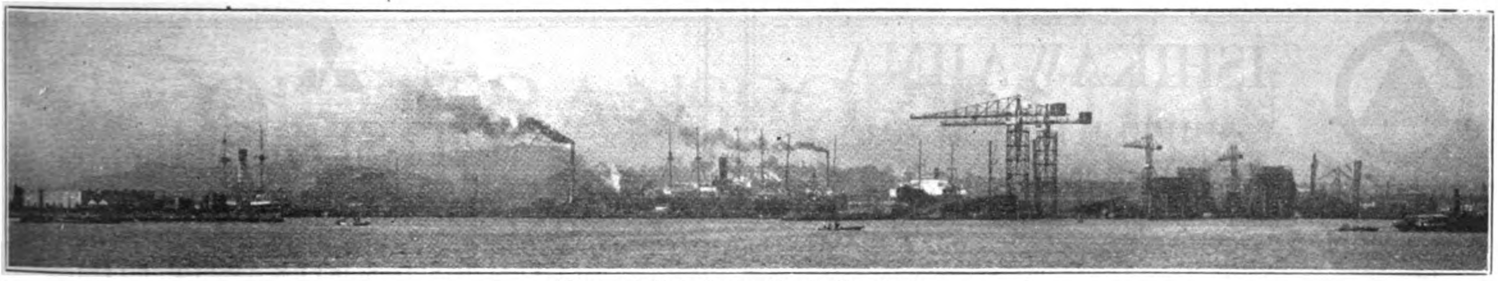
KELLY & WALSH BLDG.,
SHANGHAI

TEL. ADD.: "WHITTALL" PEKING
32 TA JUAN FU HUTUNG,
PEKING



View of Yokohama Dock Co., Ltd.

THE YOKOHAMA DOCK COMPANY, LTD.

Dock Owners, Shipbuilders, Repairers, Engineers, Machinists, Boiler Makers and Warehousemen.
Operating Dockyard, Shipbuildingyard and Storage Warehouses at Yokohama, Japan.

Head Office: **Nagasumi-cho** :: ***Warehouse Office:*** **Midori-cho**

Builders for
United States Shipping Board,
Japanese Navy,
Nippon Yusen Kaisha,
and other Principal Shipowners

Cable Address:
"DOCK"
Code Used:
A. 1. A.B.C. 4th and 5th, Bentley's

DRY DOCKS:

No. 1	625′ × 80′ × 28′
No. 2	380′ × 50′ × 26′
No. 3	480′ × 63′ × 21½′

SHIPBUILDING BERTHS:

No. 1	400′ × 27′
No. 2	490′ × 30′
No. 3	580′ × 36′
No. 4, No. 5	680′ × 38′

WAREHOUSES:

	TSUBO.
Iron Building	8,871.57
Concrete Building	1,636.99
Brick Building	2,011.72
Others	5,807.74

Directors: TOSHINOBU SUDA, Esq. *(Chairman)*, MANKICHI MIYANAGA, Esq. *(Managing Business Dept.)*, TAMATARO TOJO, Esq. *(Managing Shop Dept.)*

Agencies: NIPPON YUSEN KAISHA, London Branch. NIPPON YUSEN KAISHA, New York Branch.

All situated in Yokohama Harbour, the First Port at which Trans-Pacific Steamships arrive, and the Last Port from which they depart.

Complete Facilities for every Work and Fully Equipped up to date for

All Repairing Work. All Engine Work. All New Ship Work. All Boiler Work.

IRON & STEEL

PIG IRON PLATES AND SECTIONS

MITSUBISHI IRON AND STEEL CO., LTD.

(MITSUBISHI SEITETSU KAISHA, LTD.)

HEAD OFFICE: MARUNOUCHI, TOKYO

CAPITAL: (PAID UP) YEN 30,000,000

MILL (LLOYD'S APPROVED) KENJIHO, CHOSEN (KOREA)

Sales Agents: **The Mitsubishi Trading Company, Limited**

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ESTABLISHED 1876

ISHIKAWAJIMA

SHIPBUILDING AND ENGINEERING CO., LTD.

Capital - - - Yen 5,000,000

Shipbuilders, Engineers, Boiler Makers and Machinists.

Manufacturers of

Boilers, Mitchell's Luffing Cranes, Girders, Bridges, Marine Pumps, Turbines, Hydraulic Machinery, etc.

Licensees of

Woodeson's Water Tube Boilers and Clarke, Chapman & Co.'s Pumps

Main Works: ISHIKAWAJIMA, TOKYO.
Branch at WAKAMATSU, CHIKUZEN (Kyushu).

Telegrams: "ZOSEN," TOKYO
Codes: A.1; A.B.C. 5th Edition Impr.;
Bentley's; Complete Phrase; Western Union.

President: Dr. KAICHI WATANABE
Managing Director: TOKURO UCHIDA

MITSUBISHI WAREHOUSE CO., LD.

(MITSUBISHI SOKO KAISHA, LTD.)

LANDING, SHIPPING AND FORWARDING AGENTS, STEVEDORES, CUSTOMS BROKERS & WAREHOUSEMEN

Head Office: MARUNOUCHI, TOKYO

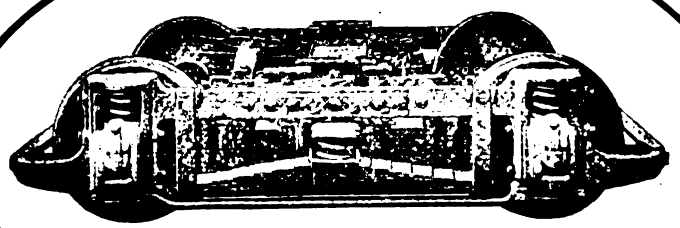
Branches: TOKYO, YOKOHAMA, KOBE, OSAKA AND MOJI

General Managers of the

KYODO UNYU KAISHA

YOKOHAMA

3 KAIGAN-DORI, ITCHOME
YOKOHAMA
WITH TWO BRANCHES IN TOKYO



No. 77-E Truck
24 or 26-in. Wheels

For
LOW-LEVEL CARS

Far East Representative:
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Pacific Commercial Co., Manila

Main Office and Works
PHILADELPHIA, U.S.A.

THE J. G. BRILL COMPANY

Builders and Exporters

ELECTRIC TRAMCARS AND TRUCKS

OIL TRANSPORTATION

The transportation of China Vegetable Oils is a problem of as great an importance as the manufacture of those oils and trade rules governing their sale.

To secure the best of out-turns a thorough understanding of the proper packing of oil is necessary. Years of study of these problems under actual shipping conditions have enabled the California Barrel Company to develop the oil barrel to its present efficiency and to gather knowledge essential to the proper handling of that container in all its phases of construction and shipping.

The Koster Company as foreign managers for the California Barrel Company operate a permanent department of service at Shanghai. In addition to this a staff of experts, trained in barrel usage, travel throughout the Orient on instruction tours.

The Koster Company has compiled the more important facts of oil transportation in barrels and copies of this information are on hand. This information will be sent you upon request.

SAN FRANCISCO
NEW YORK

THE KOSTER COMPANY
12 NANKING ROAD, SHANGHAI
FOREIGN MANAGERS
CALIFORNIA BARREL CO.
OF SAN FRANCISCO

MANILA
SOERABAYA

CABLES "KOSTER"
ALL CODES

TOSHIN SOKO

KABUSHIKI KAISHA

WAREHOUSING, FORWARDING AND EXPRESS CO.

SHIPPING	BROKERS
LANDING	STEVEDORES
CUSTOM HOUSE	WAREHOUSEMEN

WAREHOUSING AREA - - - - - - - - - 77,000 tsubo (308,000 Sq. yds.)
VALUE OF GOODS IN WAREHOUSE (latest date) - - - Yen 275,000,000
CAPITAL (PAID UP) - Yen 5,000,000; RESERVE FUND - Yen 3,098,400

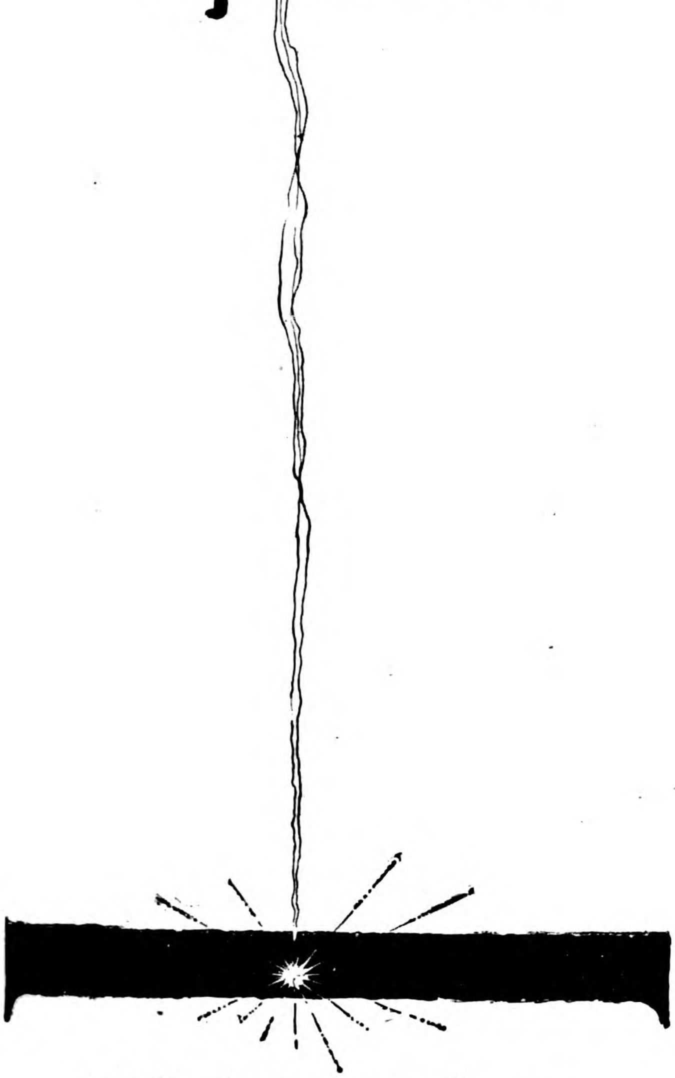
President: TOKUEMON MITSUI
Managing Directors: S. YADA and H. OKUMURA
Directors: K. HAYASHI and K. FUKUI
Auditors: T. MITSUI and T. MAJIMA

HEAD OFFICE: No. 5 HONKAWAYA-CHO, NIHONBASHI-KU, TOKYO

BRANCHES and SUB-BRANCHES:

TOKYO—Hakozaki-cho, Fukagawa-ku
OSAKA—Nakanoshima, Nishi, Utsubo, Ajikawa, Nishinari, Sakurashima Chikuko
YOKOHAMA—Shinko-cho
KOBE—Kano-cho
MOJI—Hama-cho
SHIMONOSEKI—Kannonzaki-cho

A falling spark



A single unheeded spark, falling upon inflammable material, may grow into a dangerous and destructive fire. But where the

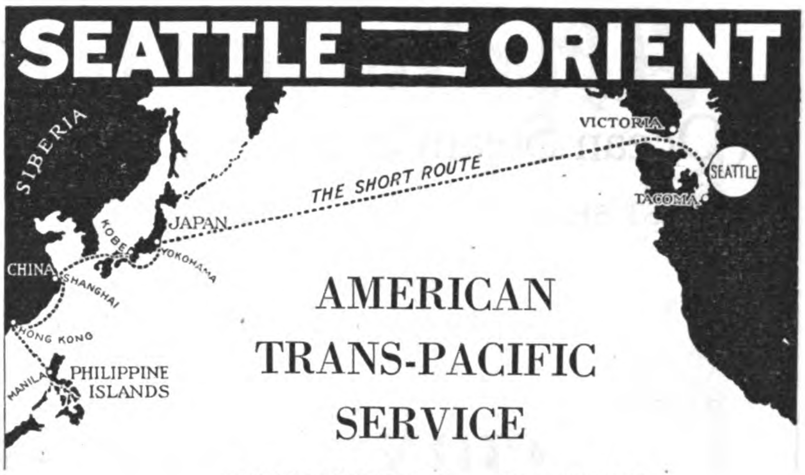
GRINNELL AUTOMATIC SPRINKLER AND FIRE ALARM

is installed no fire can spread or endure: it is quenched surely and automatically.

Mather & Platt, Ld.

Park Works, MANCHESTER — 14 Great Smith Street, LONDON, S.W.

47 SZECHUEN ROAD, SHANGHAI



PASSENGERS—FREIGHT

"THE SHORT ROUTE"

REGULAR Fortnightly sailings to Seattle-Victoria by the magnificent new U.S. Shipping Board Steamers SILVER STATE, KEYSTONE STATE, BAY STATE, PINE TREE STATE and WENATCHEE. Length 535-ft., Beam 72-ft., Speed 17½ knots.

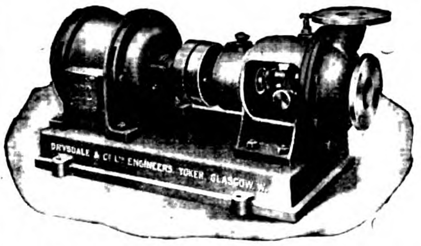
For rates and information apply To Agents

The ADMIRAL LINE — P.S.S.CO.

ANYWHERE ON THE PACIFIC

PACIFIC STEAMSHIP COMPANY

"BON ACCORD" **CENTRIFUGAL PUMPS**



"O" Type Single Suction Electrically Driven Pump

Self-Lubricating Centrifugal PUMPING ENGINES.

MARINE and LAND TYPES for all DUTIES.

HIGH SPEED ENGINES for driving DYNAMOS, FANS, ETC.

Try "Bon Accord" Packing for the Stuffing Boxes of your Pumps and Engines.

DRYSDALE & CO., LD.,
YOKER, GLASGOW, SCOTLAND.

Letters: P.O. Box 855

G. VAN GELDER

Cables: CATAI All codes

Reguliers gracht 29
AMSTERDAM (Holland)

Importer of

Кишки Барановъ

SHEEP CASINGS

羊腸

and all other animal products

Require offers, samples and consignments. Bank reference. De Hollandsche Bank voor de Middell. Zee. (The Dutch Bank for the Mediterranean—Amsterdam.)

Correspondence in English, Chinese or Russian

THE BLUE FUNNEL LINE

(Ocean Steam Ship Co., Ltd. & China Mutual S.N. Co., Ltd.)

FAST SERVICES:—

Japan, China, Hongkong, Philippines, Straits and Java to Europe via Suez Canal and to New York via Suez and Panama Canals also

Trans-Pacific between Oriental ports and West Coast of N. America.

Agents: **BUTTERFIELD & SWIRE**

CHINA NAVIGATION CO., LTD.

(PASSENGER AND FREIGHT STEAMSHIP SERVICES)

SHANGHAI TO, AND FROM,

Weihaiwei, Chefoo and Tientsin (for Peking); Newchwang; Antung.
Hankow, Ichang (with connection to Chungking), Changsha, and Intermediate Yangtsze Ports.
Hongkong and Canton; Amoy and Swatow; Ningpo; and General Coasting Services.

HONGKONG TO, AND FROM,

Manila, Cebu, and Iloilo
Weihaiwei, Chefoo and Tientsin (for Peking)
Canton; Hoihow, Pakhoi and Haiphong; Bangkok and Singapore.
Shanghai and Yangtze Ports (as above)
Sydney, Melbourne and Australian Ports (Australian-Oriental Line)

Agents: **BUTTERFIELD & SWIRE**

FIRE AND MARINE INSURANCE

FIRE

London and Lancashire Insurance Co., Ltd.
Royal Exchange Assurance Corporation.
Guardian Assurance Co., Ltd.
Orient Insurance Company.
British Traders Insurance Co., Ltd.

MARINE

British and Foreign Marine Insurance Co., Ltd.
Standard Marine Insurance Co., Ltd.
Royal Exchange Assurance Corporation.
Sea Insurance Company, Ltd.
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TAIKOO SUGAR REFINING CO., LTD.

FINEST CANE SUGARS

General Agents: **BUTTERFIELD & SWIRE**

TAIKOO DOCKYARD & ENGINEERING CO.

OF HONGKONG, LTD.

SHIPBUILDERS, SHIP REPAIRERS, ENGINE BUILDERS, BOILERMAKERS, ETC.

Agents: **BUTTERFIELD & SWIRE**

Telephone No. 4881 Central. Private Exchange to all Departments

BUTTERFIELD AND SWIRE

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From San Francisco to Japan, China, Philippines and the Far East

CALLING AT HONOLULU, YOKOHAMA, KOBE, NAGASAKI, SHANGHAI, MANILA HONGKONG

NORTH AMERICAN LINE

S.S. "Shinyo Maru"—"Tenyo Maru"
22,000 Tons, Triple Screw Turbine—21 Knots

S.S. "Korea Maru"—"Siberia Maru"
20,000 Tons, Twin Screw Turbine—18 Knots

S.S. "Persia Maru,"
9,000 Tons

PERFECT SERVICE—UNEQUALLED CUISINE

Sailings from San Francisco

S.S. "SIBERIA MARU" sails for Orient, Mar. 10, 1922
S.S. "TENYO MARU" ,, ,, ,, Mar. 18, 1922
S.S. "KOREA MARU" sails for Orient, Apr. 1, 1922
S.S. "SHINYO MARU" ,, ,, ,, Apr. 13, 1922

Sailings from Shanghai

S.S. "TAIYO MARU" sails for San F'cisco, Apr. 8, 1922
S.S. "SIBERIA MARU" ,, ,, ,, ,, Apr. 24, 1922
S.S. "TENYO MARU" sails for San F'cisco, May 5, 1922
S.S. "KOREA MARU" ,, ,, ,, ,, May 17, 1922

SOUTH AMERICAN LINE

The only Regular Direct Service between the Orient (Hongkong, Mogi, Kobe, Yokohama), Hawaii (Honolulu), San Francisco, San Pedro (Los Angeles), Mexico (Salina Cruz), Panama (Balboa), and South America (Callao, Arica, Iquique, Valparaiso)

S.S. "ANYO MARU," 18,500 Tons S.S. "KIYO MARU," 17,200 Tons S.S. "SEIYO MARU," 14,400 Tons
and three additional steamers for monthly services

HEAD OFFICE: TOKYO, JAPAN

GENERAL OFFICE, YOKOHAMA, 5 YAMASHITA-CHO

Branches: San Francisco: 625 Market St.; Chicago: 58 East Washington St.; New York City: 165 Broadway; Kobe: 83 Kyo-Machi; Shanghai: 71 Szechuen Road; Hongkong: King's Building; Manila: Chaco Building

Agency: Nagasaki: Holme, Ringer & Co.

TOYO KISEN KAISHA ORIENTAL S.S. Co.

Osaka Shosen Kaisha

(Osaka Mercantile Steamship Co.)

HEAD OFFICE: OSAKA, JAPAN

Cable Address: "SHOSEN, OSAKA."

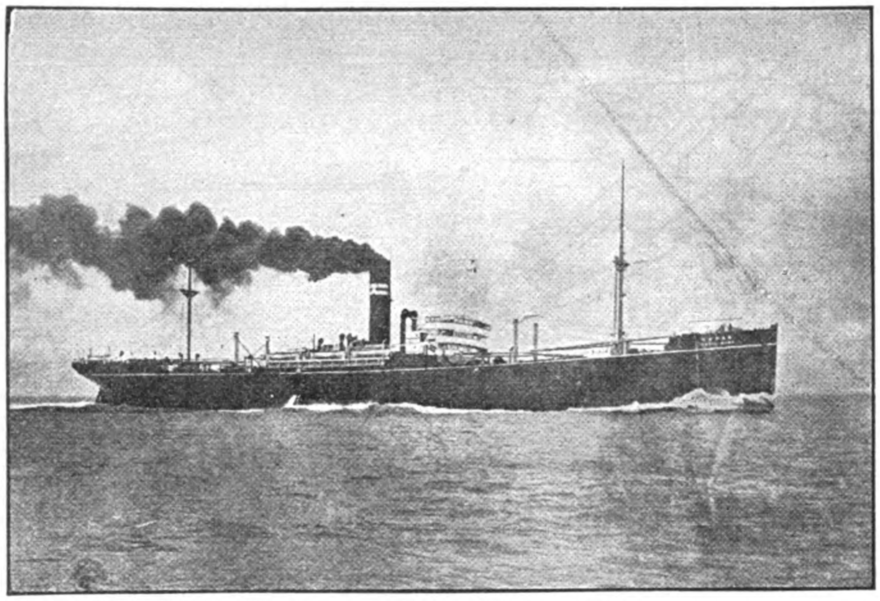
Branches and Agencies at all the important ports in the World.

Codes Used: A1, A.B.C. 5th Ed., Scott's 10th Ed. & Bentley's.

Capital: Y. 100,000,000

Reserves: Y. 66,000,000

40 Regular Lines with a Fleet of 500,000 Tons Gross.



PRINCIPAL REGULAR LINES:

JAPAN-EUROPE LINE (via Suez)—Monthly—Ports of Call: Yokohama, Kobe, Moji, Shanghai, Hongkong, Singapore, Colombo, Port Said, Marseilles, London, Antwerp, Rotterdam and Hamburg.

JAVA-EUROPE LINE:—Monthly—Ports of Call: Sourabaya, Padan, Colombo, Port Sudan, Suez, Genoa, Marseilles, Antwerp and Hamburg.

CALCUTTA-NEW ORLEANS LINE: 7 sailings per annum—Ports of Call: Calcutta, Singapore, Hongkong, Nagasaki, Kobe, Yokohama, San Francisco, Balboa, Cristbal, Cienfuegos and New Orleans.

SINGAPORE-NEW YORK LINE:—Monthly—Ports of Call: Singapore, Hongkong, Shanghai, Moji, Kobe, Yokohama, San Francisco, Balboa, Cristbal, Havana and New York.

JAPAN-BOMBAY LINE:—Fortnightly—Ports of Call: Yokohama, Yokkaichi, Osaka, Kobe, Moji, Hongkong, Singapore, Colombo and Bombay.

HONGKONG-PUGET SOUND LINE:—Fortnightly—Ports of Call: Hongkong, Manila, Keelung, Shanghai, Nagasaki, Kobe, Yokkaichi, Shimizu, Yokohama, Victoria, Seattle, Tacoma and Vancouver.

JAPAN-SOUTH AMERICA LINE:—Monthly—Ports of Call: Yokohama, Kobe, Nagasaki, Hongkong, Singapore, Colombo, Mauritius, Durban, Cape Town, Rio de Janeiro, Santos and Buenos Ayres.

JAPAN-AUSTRALIA LINE:—Monthly—Ports of Call: Yokohama, Kobe, Osaka, Moji, Hongkong, Manila, Sydney, Melbourne and Adelaide.

JAPAN-JAVA LINE:—Monthly—Ports of Call: Osaka, Kobe, Moji, Keelung, Manila, Sandakan, Tawao, Batavia, Sourabaya and Macassar.

SERVICES TO CHINA.—

OSAKA—Dairen Line.—Semi-Weekly.
OSAKA—Tientsin Line.—6 Sailings per month.
OSAKA—Tsingtau Line.—2 Sailings per month.
YOKOHAMA—Dairen-Tientsin Line.—About 8 Sailings per month.
TAKAO—Tientsin Line.—2 Sailings per month.
Keelung-Hongkong Line.—Weekly.

Besides the above mentioned, Mail and Passenger Services are maintained by over THIRTY-FIVE REGULAR LINES, calling at all important ports in JAPAN, as well as STRAITS, DUTCH EAST-INDIES, FORMOSA, CHINA, KOREA, Etc., Etc.

COMPANY'S LOCAL OFFICES IN CHINA

AMOY, CANTON, FOOCHOW, HANKOW, SHANGHAI, TIENTSIN, DAIREN, HONGKONG

KOKUSAI KISEN KAISHA

Nominal Capital	- -	Yen 100,000,000.00
Paid-up Capital	- -	„ 87,500,000.00
Aggregate Tonnage	- -	500,000 Tons

FLEET OF STEAMSHIPS

Name	Tons D.W.	Name	Tons D.W.
Rozan-Maru	8,700	Seifuku-Maru	9,100
Vancouver-Maru	9,100	Suez-Maru	6,600
Boston-Maru	8,800	Daio-Maru	9,000
Tofuku-Maru	9,100	Kashu-Maru	8,800
Chifuku-Maru	9,100	No. 2 Kifunesan-Maru	5,000
Ryufuku-Maru	9,100	Yousan-Maru	5,000
Hankow-Maru	6,400	Taisan-Maru	5,000
Yoni-Maru	11,000	Yuri-Maru	11,000
Taibu-Maru	8,900	Texas-Maru	11,000
San Francisco-Maru	9,100	Tamatsu-Maru	6,600
Naple-Maru	9,100	Eifuku-Maru	9,100
Glasgow-Maru	9,100	Kifuku-Maru	9,100
Yayoi-Maru	8,700	Toyofuku-Maru	9,000
Yaye-Maru	11,000	Raifuku-Maru	9,100
Malta-Maru	8,700	Keifuku-Maru	9,100
Buyo-Maru	8,800	Washington-Maru	9,100
Brazil-Maru	9,100	Tokufuku-Maru	9,100
Kofuku-Maru	9,100	Portland-Maru	9,100
Yezari-Maru	6,900	England-Maru	9,100
Yugao-Maru	5,000	Chili-Maru	9,100
Yubaye-Maru	5,000	Argentine-Maru	9,100
Sydney-Maru	6,400	Port Said-Maru	9,100
Shanghai-Maru	6,400	New York-Maru	9,100
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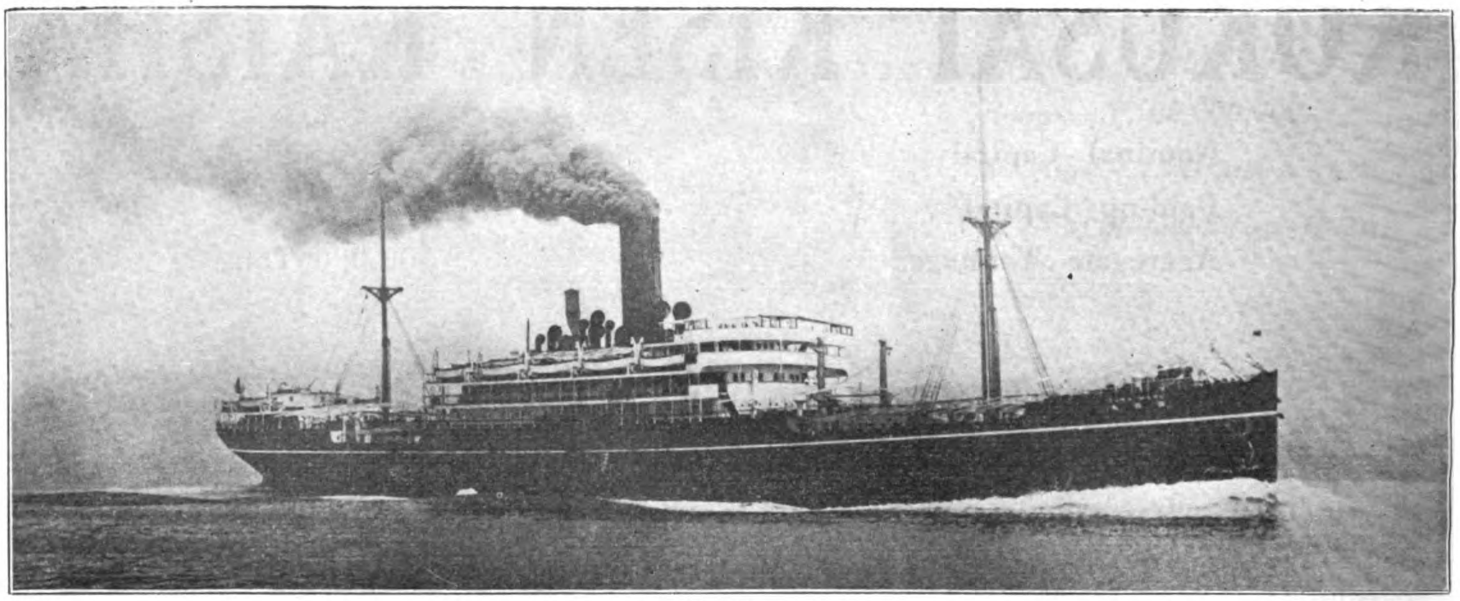

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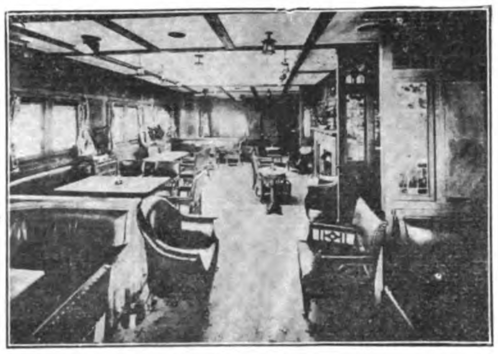

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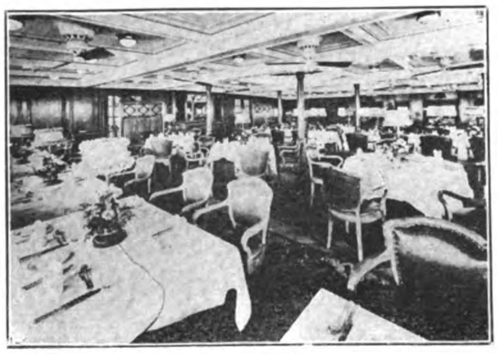

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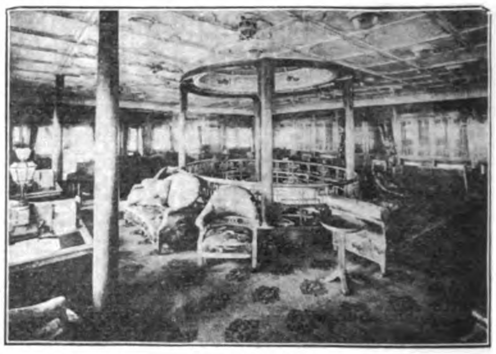

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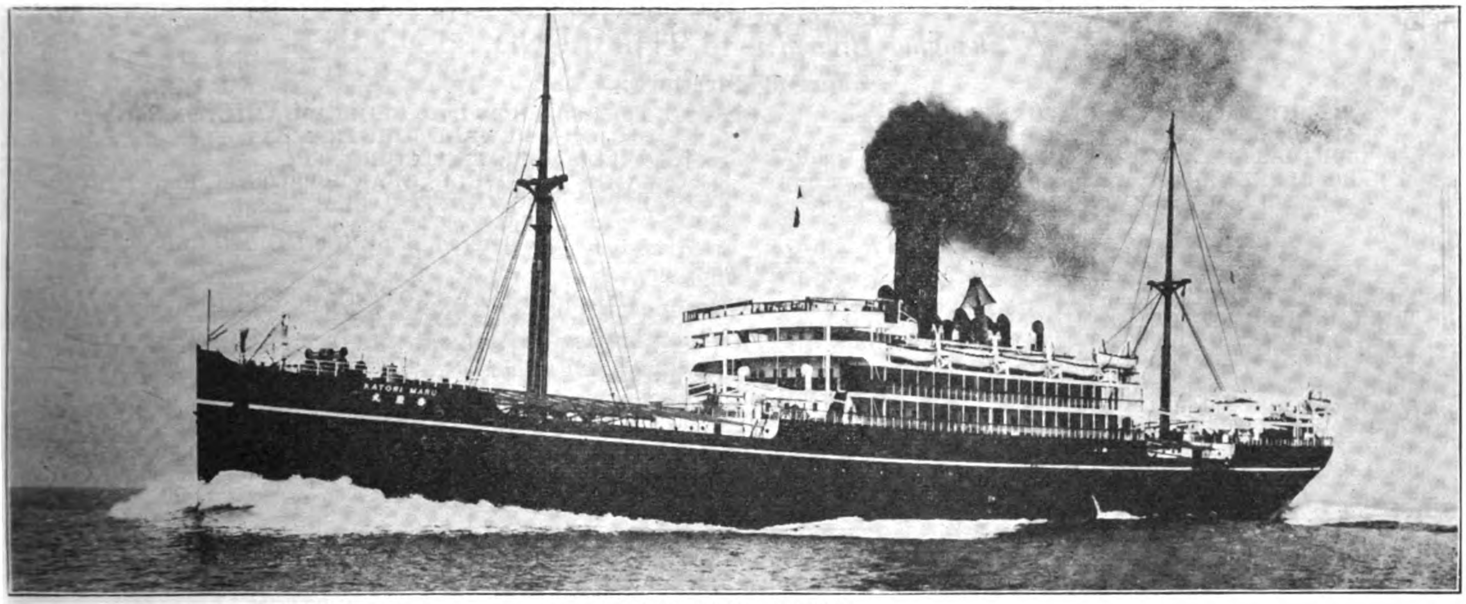

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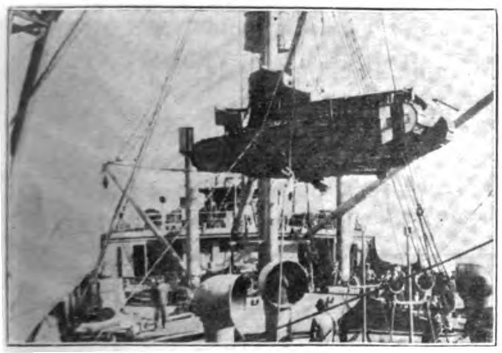
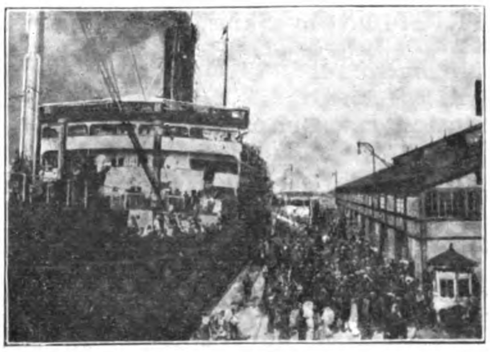
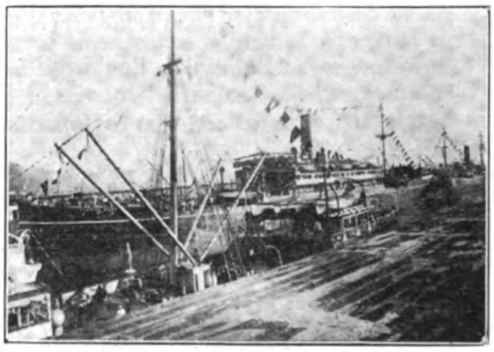


Landing a Tank



Dock at Yokohama



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The Far Eastern Review

ENGINEERING FINANCE COMMERCE

VOL. XVIII SHANGHAI, FEBRUARY, 1922 No. 2

SIDELIGHTS ON THE CONFERENCE

TWO years ago, America rejected the League of Nations, spurned a tripartite alliance for guaranteeing the safety of France against possible future German aggression, and to-day accepts a four power treaty embracing the essence and principles of the Wilsonian league, with an Article Ten thrown in, to cover the Pacific insular possessions of the signatory powers. We refused to ratify an alliance which compromised us to come to the aid of France and then invited the latter to enter into an agreement which guaranteed our possessions in the Pacific, providing the opportunity for M. Viviani (heading the French delegation at Washington) to remark, "France will assume all of the obligations that fall upon her in the treaty. France has never declined to stand by her plighted word. When there has been a question of standing by her plighted word or taking up arms, France has never hesitated."

The four-power treaty comes to supersede the Anglo-Japanese alliance and brings the United States into a miniature Far Eastern League of Nations which takes on the character of an alliance for the protection of island possessions in the Pacific. There is little difference between Clause Two of the new treaty

THE NEW PACIFIC TREATY

I.

The high contracting parties agree as between themselves to respect their rights in relation to their insular possessions and insular dominions in the region of the Pacific Ocean.

If there should develop between any of the high contracting parties a controversy arising out of any Pacific question and involving their said rights which is not satisfactorily settled by diplomacy and is likely to affect the harmonious accord now happily subsisting between them, they shall invite the other high contracting parties to a joint conference to which the whole subject will be referred for consideration and adjustment.

II.

If the said rights are threatened by the aggressive action of any other power, the high contracting parties shall communicate with one another fully and frankly in order to arrive at an understanding as to the most efficient measures to be taken, jointly or separately, to meet the exigencies of the particular situation.

III.

This treaty shall remain in force for ten years from the time it shall take effect, and after the expiration of said period it shall continue to be in force subject to the right of any of the high contracting parties to terminate it upon twelve months' notice.

IV.

This treaty shall be ratified as soon as possible in accordance with the constitutional methods of the high contracting parties and shall take effect on the deposit of ratifications, which shall take place at Washington, and thereupon the agreement between Great Britain and Japan, which was concluded at London on July 13, 1911, shall terminate. The Government of the United States will transmit to all the signatory powers a certified copy of the proces-verbal of the deposit of ratifications.

The present treaty, in French and in English, shall remain deposited in the archives of the Government of the United States, and duly certified copies thereof will be transmitted by that Government to each of the signatory powers.

The following provisions are in the form of a separate agreement signed at the same time:

In signing the treaty this day between the United States of America, the British Empire, France and Japan it is declared to be the understanding and intent of the signatory powers:

1. That the treaty shall apply to the mandated islands in the Pacific Ocean; provided, however, that the making of the treaty shall not be deemed to be an assent on the part of the United States of America to the mandates and shall not preclude agreements between the United States of America and the mandatory powers respectively in relation to the mandated islands.

2. That the controversies to which the second paragraph of Article I. refers shall not be taken to embrace questions which, according to principles of international law, lie exclusively within the domestic jurisdiction of the respective powers.

Washington, December 13, 1921.

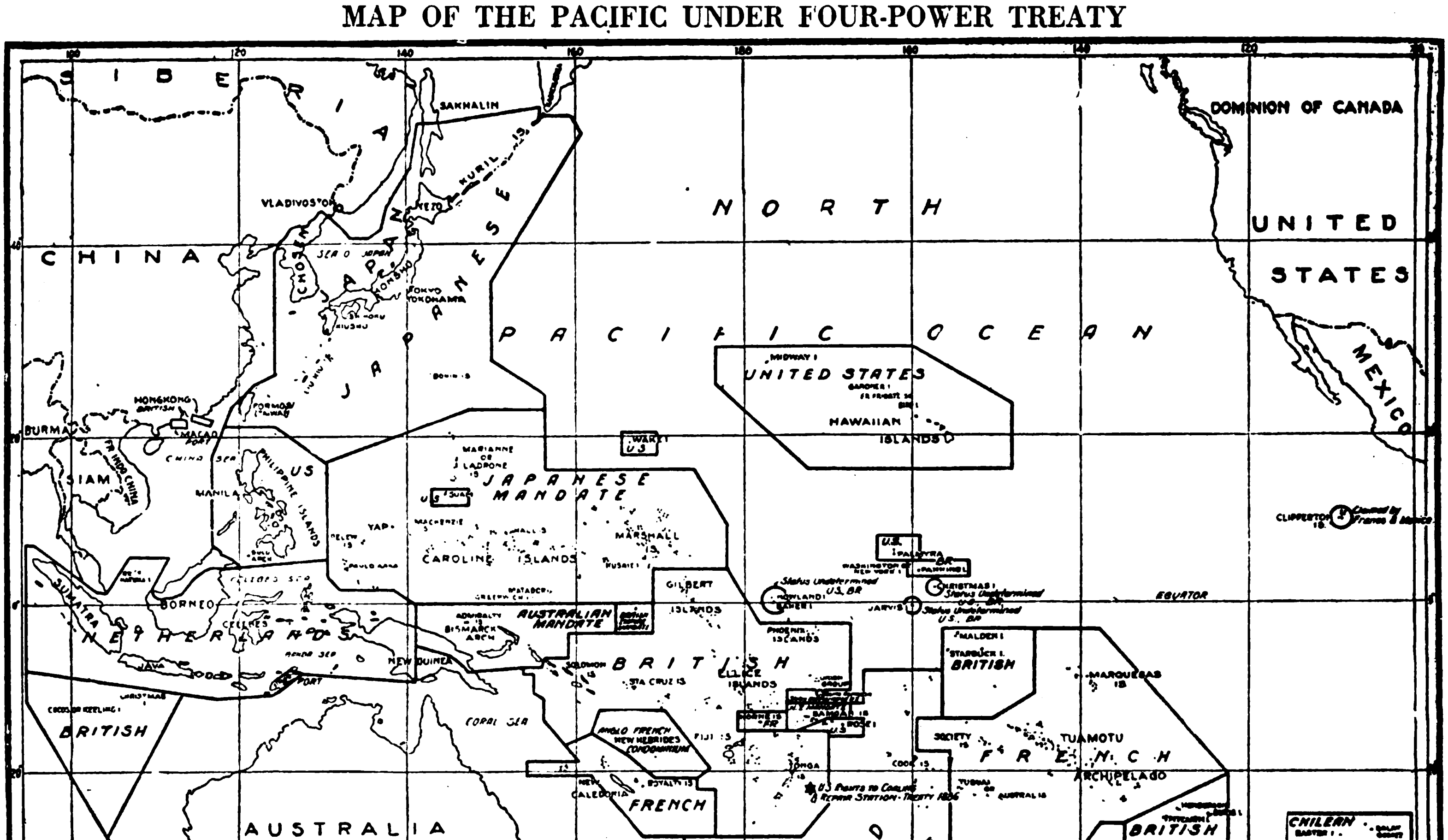
and Article Ten of the League of Nations which expressly undertakes to guarantee the territory of its members against external aggression, but in regard to doing this it provides : "In case of any such aggression or in case of any threat or danger of such aggression, the council shall advise upon the means by which this objection shall be fulfilled."

The difference between the two is slight, and, in effect, the Pacific treaty is one of alliance with teeth in it, which is as it should be, if it is to carry out its purpose. America has come out of her seclusion, and entered upon a new world career which makes us a partner of Japan in upholding the peace of the Pacific and confirming each power in its possession and enjoyment of lands now held by them under mandate or in trust for their lawful owners.

As was to be expected, the treaty has re-opened the partisan feeling that characterized the fight over the League of Nations, with the republicans standing behind a jubilant administration and the democrats waiting for the physchological moment to spread consternation amongst the merry-makers. The fact that the treaty has the full support of those who killed the Versailles treaty goes to show that the real reason why the latter was blocked by the Lodge forces in the senate was simply because it was proposed by a democratic administration, and the republicans slaughtered it "to get even with Wilson." Wilson's friends are keeping quiet, and, although there are indications that an effort will be made on the part of the democratic leaders to block the treaty, their tactics will tend more to holding up the republican party to the ridicule of the nation for its partisan politics in defeating the Versailles treaty. The leading democratic papers concede that it meets with the general approval of the country, and is accepted as a belated republican indorsement of the League of Nations, leading in the near future to American membership in the league, and so vindicating their leader and furnishing the democratic party with campaign material for the next presidential elections. The irreconcilables headed by Senator Reed of Missouri can be depended upon to fight ratification of the treaty. Borah is keeping silent. Johnson's attitude has not been disclosed and La Follete can usually be depended upon to fight anything.

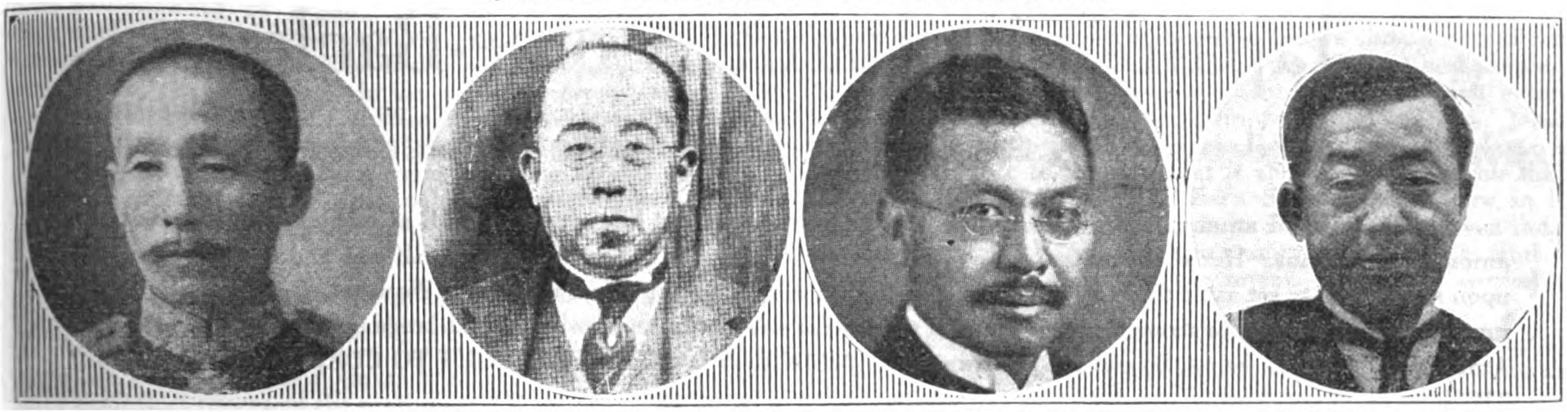
On the other hand, the Democratic *Brooklyn Eagle* warns us that "we are in for a fight on the treaty. One of the chief arguments which will be offered against it is that there are certain points of doubt as to just what it includes or involves." Indications are that an attempt may be made by friends of China to kill the treaty in the same way they assisted in hamstringing the Versailles treaty, simply because of a feeling that Japan has come out of the conference with greater power and prestige than when she went in, and that China's rights have not been sufficiently restored. It

MAP OF THE PACIFIC UNDER FOUR-POWER TREATY



This Map Shows in Outline the Mandates, Claims and Sovereignties as Considered by the Disarmament Conference in Framing the Four-Power Treaty, and It Also Illustrates Problems Faced in the Future Settlement of Various Contentions. The Former German Possessions Are Within the Inclosures of the Japanese, the Australian and the New Zealand Mandate. *(New York Times)*

JAPAN'S DELEGATION AT WASHINGTON



Admiral Kato | Prince Tokugawa | Ambassador Shidehara | Vice-Minister Hanihara

is needless, however, to say that any such tactics will lose for China the friendship of the other powers and lay her open to the renewed charge of being an obstacle to peace. "A people incompetent to run their own affairs should be very careful about intervening in the affairs of other strong, well equipped nations who have been brought to the verge of war by the inability of China to govern herself and preserve neutrality or sovereignty."

"Two months ago," writes Frank H. Simonds in the *Review of Reviews*, "I told my readers that there was every sign that the United States and Japan were drifting toward war in the Far East. Since Chinese conditions are what they are, it would be rash to forecast that all danger has been removed, but at the least all apparent danger has been eliminated and the mutual misunderstandings and apprehensions of the two nations have been enormously reduced if they have not been finally banished. If this were the sum total of achievement of the Washington conference it would still justify the wisdom of the president in calling it and testify to the loyal service of all who participated in it."

The consensus of American opinion favors the treaty as a splendid conception, removing all sorts of causes for serious disputes, a base upon which may and should be founded a far more extensive co-operation. The fact is generally acclaimed that the president and Secretary Hughes have worked out a plan that will insure peace and lighten the intolerable tax burdens of a suffering and impoverished people and opinion is strong that the treaty should be ratified promptly and obstructionists swept out of the path. What happened two years ago, will not be tolerated at the present time.

When it was discovered that the four-power treaty extended over the Japanese homeland according to a private agreement made by the American delegates, the only reasonable inference was that Japan had exacted this guaranty as the price of scrapping the Anglo-Japanese alliance, which provided the enemies of Japan with the opportunity of charging her with descending to trading tactics. But, as the *New York World*, declares, "nothing more extraordinary has come out of the Washington conference than the report that the Japanese object to the guarantees of the four-power treaty and are asking that Japan proper be excluded from its provisions."

With the final ratification of the four-power treaty the old Anglo-Japanese pact will automatically fall into the discard. Everybody should be satisfied to this outcome of a most distressing situation. Great Britain lives up to her traditional reputation for playing the game, standing fairly by her ally until a new and stronger instrument takes over her obligations. The pressure upon Britain last year to terminate the alliance and isolate Japan was tremendous. Condemned by her Pacific dominions, appealed to by America and villified by China for the existence of an alliance which had carried Japan to the point where she was considered a menace, the attitude of the British government throughout has been one that compels admiration for the generous, whole-hearted manner in which she stood by her partner. For this was the real crux of the conference, the pivot around which all the minor questions revolved. Japan went to the conference in fear and doubt with the menace of isolation and relegation to the rank of a second rate power staring her in the face. The tirades of the anti-alliance party in England, the thunderings of Northcliffe and his satellites, the clamor in America and the strenuous propaganda of China created a public opinion before which a weak British government might have bowed and condemned Japan to face the world alone. British opinion as a whole, however, was not influenced by the vigorous campaign to isolate Japan, and as typical of the general attitude on the question, the *Dundee Courier* says:

"Japan, on the other hand, has many coincidences of circumstance and interest with the British empire. She, too, is an island kingdom, and she proved a faithful and powerful ally in the war. These are facts which must be remembered when there is easy talk about cancelling the alliance. What are we to put in its place? A vague assurance of friendship from the American government of the day?

"There must be something more solid than that. If America can give a definite guarantee, well and good. If Britain, America and Japan can forge a triple alliance that would be best of all."

That Japan emerges from the conference stronger than ever is due largely to the fidelity and honor of her ally. Japan's place as a first class power, one of the Big Four, is now assured to her.

True, the new pact cannot be called a substitute for the old alliance which gave specific guarantees. Disagreements between the contracting parties are to be brought before a joint conference of four. It is, as Mr. Frank H. Simonds points out in the *Review of Reviews*, a guarantee of the *status quo*, but not a guarantee to maintain it by our force, but by our good behavior—just that and nothing more." The difference in the two treaties as explained by Mr. Hanihara, "was the difference between whisky and water," but such as it is, it is accepted by the Japanese as constituting a promise which is to take the place of the Anglo-Japanese alliance.

As the elimination of the old alliance was one of the primary objects of the conference, Americans must remain content and accept the responsibilities and obligations which the new line-up places upon us. We willed it so. It was our party. We must play the game and not cry baby, as we did after Paris. China is not satisfied. Her publicists are crying to heaven that they have been betrayed, that Japan is now in a stronger position than ever to work her will in Asia. This, notwithstanding that Japan has subscribed to all the committments upholding China's sovereignty, integrity and the "open door." It is difficult at times to understand just what the Chinese *do* want. Last year they sent their most able publicists to America and Europe to oppose an extension of the Anglo-Japanese alliance. They have succeeded. All credit must be given to them for the manner in which they presented China's side of the case. The British and American governments and British merchants in China menaced with a boycott perhaps will not endorse the methods employed in their campaign, but they did their duty as they saw it. Yet the Chinese are disappointed and criticize the weakness of their leaders and publicity methods. They are hard to satisfy. They wanted to isolate Japan and place her in the dock before the court of nations. They might have succeeded had it not been for Great Britain. China overplayed her hand, and while Britain accepted the necessity of terminating the pact, it was done in an honorable manner.

Japan's Brilliant Come-Back

Japan has had an amazing success in the Pacific conference and has come out with a rehabilitated reputation amongst Americans. Her chivalry and sense of justice have triumphed. She has met us half way and it now devolves upon Americans to set aside their prejudices and go the other half to clasp hands with her. We must co-operate with her morally and financially to strengthen the hands of the liberal element in Japan who talk the language that we understand. American capital can help. So can the government. JAPAN HAS EARNED THE RIGHT TO CORDIAL CO-OPERATION.

SUCH is the verdict of America as expressed by her leading newspapers. Such is the answer of the United States to the campaign that has been waged for the past two years to incite hostilities. Such is the real reaction of the country which has been concealed from the people of the Far East by the mass of anti-Japanese correspondence and literature disseminated from Washington by interested parties. "Japan astonished the Americans with her spirit of give and take and a readiness to meet us more than half way on all essential points," says the *New York Herald*, who led the attack upon Japan at the opening of the conference through the articles of Mr. Louis Seibold. The *Herald* goes further and testifies that "Japan has greatly surprised public opinion by the large view she has taken of all matters and by her readiness to co-operate with other nations in the interest of world betterment." In the matter of the *Mutso*, the same paper adds, "Japan had met the other delegates of the conference in so fair a spirit and on so many points that it was amply due her that in the circumstances they should meet her in this matter of profound national objection to the destruction of the *Mutso*." The *New York Herald* has lived up to its grand traditions in so frankly and quickly counteracting editorially the wrong impressions created through its reading columns.

The *Newark Star* gives perhaps the best composite idea of the reaction of the country as a whole on Japan and her policies. It says :

"It was Japan who was expected to throw emery powder into the works of the Washington conference, if any were thrown. It was Japan who was feared as the proposer of jokers, the spinner of intrigue, the smooth and wily trickster—far too clever for American and European diplomatists—who would prove this huge show to be a comedy.

"To date, Japan has been everything it was feared she would not be. Her request for a modification of the Hughes' naval disarmament program involves just one warship. She has not balked or been sullen over the discussions of the Far East questions.

"Just as the Japanese delegates have been eager to accept the principle of the 'open door' so have they committed their government to other policies warranted to prevent friction in the Pacific. Japan at Washington is quite another country than the Japan at Versailles.

"It is doubtless true that Japan is forced into a position of fair-dealing and concession. She cannot pursue an individualistic course in the Far East. She has hoped and worked for the support of Britain as against the United States. Britain elects to do at the Washington conference as America does. Japan promptly swallows disappointment and falls in line.

"But forced to give way or not, Japan has done it gracefully. Unless she reverses her present tactics she will come out of this conference with a rehabilitated reputation among Americans."

The correspondent of the *London Daily Chronicle* says that—

"It must be admitted that so far Japan has had amazing success in this conference. The quadruple treaty speaks for itself. Japan came to Washington with many misgivings. Her chief fear was of isolation, in other words, loss of the English alliance with nothing of much value as a substitute. What she now receives is much wider in scope—a mutual pledge by big Pacific powers that makes the ocean in which the island empire is situated absolutely safe. The agreement not to fortify islands puts the final seal on Japan's security: she may now rest in placid confidence behind an impenetrable strategic shield of from 4,000 to 8,000 miles of navally untraversable ocean."

The *Wheeling (W. Va.) Register*, one of the first American papers to note the change in popular sentiment, said :

"The Japanese bugaboo appears about ready to collapse. It has served well the purpose for which it was created (spurring America on to greater and greater war preparations for the benefit of corpulent armament builders and munition makers), but it is now doomed for the ash can where it has long belonged, and much because of the attitude taken by the Japanese delegates at the disarmament conference."

The position of Japan is also ably outlined by the *Rochester Post Express*, which says :

"That Japan is an intensely ambitious nation cannot be denied. But the Japanese are a people capable of adapting themselves to every change of circumstances. Their demands on China have been abated because they realized that justice necessitated concessions to their Chinese neighbors.

"No longer does Japan insist on her twenty-one demands. She puts generosity above self-interest. China is unprogressive. Japan is progressive. But those who suspected that Japan desires to rob China were utterly wrong.

"The negotiations between these two great nations of the Far East have resulted in an expression of willingness by Japan to transfer the Shantung railway to China on certain equitable terms. With regard to other nations Japan favors the 'open door' in China. She has become the ally of the United States against whom she was supposed to be meditating war.

"If her militarists had an aggressive policy, the true Japan has discarded it, and freely entered into the brotherhood of nations.

"Let us, then, honor Japan as a heroic nation whose chivalry and sense of justice have triumphed over those selfish instincts from which neither men nor nations are free."

Mr. Elmer Davis, special correspondent of the *New York Times*, writes :

"Washington has taken a liking to most of its guests at the conference, even if not all the guests have taken a liking to Washington. Perhaps, if any one of the delegations has made a more favorable impression than the others, the honor would have to be given to the Japanese, whose representatives have been—as Japanese representatives abroad usually are—admirable examplars of the old culture of Japan, living proof that it can be combined with practical modern qualities without suffering deterioration."

The *Philadelphia Record* supplements the above as follows :

"Japan balks at restoring Port Arthur to China, and if Hongkong is left with England, Japan might keep the position which it has captured twice, the second time from Russia at a cost of 22,000 men. Japanese interest in this place is not wholly sentimental. China is not strong enough to hold the point, and an enemy at Port Arthur would be a great danger to Japan. We probably know now why Japan insisted on 70 instead of 60 per cent. of capital ships. It can recede from that position in consideration of being allowed to keep Port Arthur. *If China can get back Weihaiwei, Tsingtao and Kwangchow without cost and without an effort it will be a sufficient triumph for Oriental diplomacy.*"

Without a dissenting voice British journalists at the conference bear willing testimony to the brilliant success of Japan. At no point has she been open to the criticism of playing a double game. To sum up, the re-action of sober-minded America on Japan as opposed to the professional jingoes and trouble breeders, is best set forth in the following eulogy appearing in the January number of *World's Work* :—

"The Japanese delegates at the conference have been a delight to the well-wishers of Japan. They have dropped the reticence which made the Japanese at Paris almost unintelligible to the Western understanding. Now that they have spoken freely, their conversation reveals them in an unexpectedly pleasant light. They talk the language of the West, and, better yet, they talk the language of Western liberalism. No mere facility in the use of the catch-words of democracy could for weeks on end conceal an ignorance of the realities of the subject matter. These Japanese have really grasped the philosophy of Western ideals as we know them.

"Their presence here as the plenipotentiaries of Japan is profoundly significant. Premier Hara doubtless knew his men when he chose them, and Premier Takahashi doubtless knew them when he confirmed their warrant to act for his government. They doubtless represent the sentiment that now controls Japanese policy—and that sentiment is certainly very different from the feelings which controlled the government of Japan four years ago.

"Events in Japan indicate a silent revolution in that country of the most far-reaching importance. The accession of Hirohito to the regency brings to the throne the first ruler of Japan who has traveled in the West and been educated in Western ideas. That accession was apparently timed to be significant at the moment when America, Great Britain and Japan were composing their differences in Asia. It is coincident with studied announcements of the retirement of the two of the three living elder statesmen who represent the ideas of German origin upon which the constitution of Japan was built. Unless evidence that has a striking unanimity of character is pure coincidence, Japan is giving notice to the world of a new tack that will bring her morally into the front rank of modern nations. Apparently she has made the great decision—that she will compete with the world hereafter in a generous rivalry of fair play and in an emulation of the best practices of advanced democracy.

"This is a golden opportunity for America to further the cause of civilization. The way to do it is to meet Japan half-way. Every effort of our government and of our people should be put forth to establish contact with the Japanese government and people, to strengthen the hands of that element in Japan which believes with us in the doctrines of liberalism, peace and concord. Japan's new attitude must pay dividends in Japan, or it will not last. We must co-operate to the end that it shall be so profitable that it cannot be overthrown. Mr. Mark Sullivan, elsewhere in this magazine, has indicated some of the ways in which, even individually, we can improve the opportunity. American capital can likewise help. So can the government. Japan has earned the right to cordial co-operation."

In these words the great magazine owned in part by Mr. Walter H. Page, ex-ambassador to Great Britain and stalwart supporter of Woodrow Wilson, undoes the propaganda so viciously spread by those officials of the past administration who have been foremost in impugning the good faith of Japan in order to distract attention from their own diplomatic shortcomings. It has been clear for the past two years that a great change was taking place in Japan, that her business men, bankers and merchants were more and more dictating the policy of the government, a policy that has for its ultimate goal co-operation and harmony with America and whole-hearted friendship for China. THE FAR EASTERN REVIEW has held steadfast to its faith in the good intentions of this element and supported the campaign for better relations and a peaceful solution to our national misunderstandings. Japan has played the game squarely and fairly. She has met us on all points. She has earned the right to our respect and cordial co-operation. Her friendship is our best asset in the Pacific. The conference has ushered in a new era, which finds us allied to Japan for maintaining the peace of the Pacific, a pact in which she will ungrudgingly carry her full share, irrespective of what it may cost.

China's Victory

JAPAN'S brilliant success at Washington is equalled, if not surpassed, by the great moral victory scored by China. Never before in the history of the world (perhaps never to be witnessed again) has a bankrupt, chaotic and hopelessly disorganized government received such consideration, such courtesy, such assurances of friendship and desire to assist it as did that of China at Washington. The treatment accorded the Chinese stands unparalled in history and the names of Sze, Koo and Wang will be honored for their heroic fight against the most tremendous handicaps ever faced by the plenipotentiaries of any nation. They stood pitted against the strongest diplomats and minds of the day, with nothing behind them but the moral force of their appeal. They represented a government unworthy of the name, one admittedly incompetent to carry out any committments that may have been entered into on its behalf. Their voice carried no weight, no authority; they were beggars before the court of world justice.

The *New York Journal of Commerce* described the situation succinctly when it declared that

"all that can possibly be demanded of the powers by the government of China to-day, is to recognize it as a going concern. To assume its ability to discharge any international responsibilities that might be accepted on its behalf is to predicate for it a length of life to which it cannot aspire. Confessedly, the government of Peking is bankrupt, it has defaulted on its debt payments: it can pay no salaries to those in its employ, and even the expenses of the delegation in Washington are being paid, according to the best information available, out of a fund subscribed by Chinese merchants abroad."

The three official representatives of China not only labored under these tremendous handicaps, but their position and efforts were made more trying, more difficult, by the constant interference of the swarm of unofficial delegates who sought to impose their views upon the conference. "The attempts to disrupt the Chinese delegation and weaken its efforts at the conference have come not from the representatives of other powers who have differed with China's proposals, but from within the delegation itself."

Mr. Junius B. Wood, the able correspondent of the *Chicago Daily News*, tells us that these inside differences arose when united action and harmony were most needed in the difficult negotiations. Even Dr. Tsao, who resigned as chief secretary of the Chinese Delegation because he felt that China was not receiving a square deal, had his ire aroused at the anonymous interviews given out by "unofficial delegates" questioning the consistency of the policy which Secretary Hughes had followed in regard to China.

"As long as the three delegates are here representing our government," said Dr. Tsao, "they alone can express the policies of the delegation or have the right to comment on the work of the conference. If one of several of our advisers or secretaries quit, that is purely a private affair of our delegation. Mr. Briand, who was the chairman of the French delegation, went home, but that did not change the status of the delegation in the conference. A changing of advisers certainly cannot do so. That is happening with regularity in all the delegations.

"That these advisers should criticize the work of their delegates or of other persons in the conference is both premature and in bad taste. At the most it is not entitled to any more weight than an expression of their personal opinions, not an official opinion of China, which can come only from the three delegates.

"There certainly is no basis for any charge that Mr. Hughes has weakened in his efforts to secure justice for China. No such feeling is entertained by us. We realize that he has done so much for us, and it is too early to express either gratification or disapproval of the final decisions of the conference, which still are a long way off."

"The complaints about the policy of the Chinese delegation and about the treatment it has received from delegates of other countries have not been limited to public interviews," adds Mr. Wood. "Numerous Chinese have called on members of other delegations, pouring out their real or fancied troubles, and creating an impression in many quarters that the delegation itself is cantankerous and inclined not to be satisfied with anything."

The attempts of these so-called people's delegates working with the Chinese students and other organizations in the United States to intimidate the official representatives, together with the untiring propaganda of Dr. Ma Soo, the Canton delegate at Washington, to discredit the Peking government and wash China's dirty linen at the conference, provided Washington and the world an object lesson of the rivalries and disorganization in China's domestic affairs. Chinese publicists, students at colleges, unheard of before the conference as writers or experts on their own problems, deluged the press with copy, all emphasizing that China would not be bound by the terms of the Versailles treaty and that the Shantung question would have to be thrashed out in full conference. Various unofficial programs were presented to the newspapers as the irreducible minimum of China's demands, all intensely patriotic, but all losing sight of the one great fact that China is unable to maintain or guarantee her sovereignty. This divergence of views, lack of organization and program, and squabbling amongst themselves more than anything else, helped to convince the conference that China was as yet in no position to be entrusted with the full management of her own affairs.

China at Washington stood revealed to the world in all her "make believe," striving desperately to "save face" by ignoring facts. It laid her open to such bitter criticism that her people should be convinced of the precarious position they hold in hollow and more misleading. We have seen the strength of Chinese statecraft; here is its weakness. It has an implicit faith in the virtues of "make see," and accordingly the Chinese delegate claims to the representatives of the Pacific powers, well acquainted with the truth, that China stands upon the same plane in respect of law and justice as do the most advanced and most intelligent of Western states. The ingenuousness with which he assumes that an imposture so palpable can pass muster is almost touching—especially when he hnows that not all the artifices and obstruction of his government can prevent the proposed commission of enquiry from letting in the harsh light of day upon the fiction."

After a scathing criticism of Japan's former policy in China and recognizing the change that has taken place as the result of a new outlook on the future of the empire, the *Birmingham* (*England*) *Post* scores China in the following words :—

"The real obstacle to a harmonious settlement is one not foreseen by most people —the attitude of China, one absolutely inconsistent with existing facts and with any possible settlement. China came to the conference as an injured party, wronged by Japan. She is there now, in opposition to Britain if not to America, claiming the consideration and aid needed by a weak nation and the rights and privileges of a strong one. Unless she can be persuaded to change her position, it seems to us impossible for the conference powers to assist her. In that case she will go on to disaster and partition—partition by her own warring elements if not by outsiders. If that catastrophe should occur, then Japan may conceivably revent to her old policy. But to-day she is, we believe, desirous to follow the new one. And so, despite Mr. Koo and his preposterous assumptions and claims, the situation is still not beyond hope."

This is taken up by the *South Wales* (*Cardiff*) *News*, who calls attention to the notorious weakness and corruption of the Peking government, the inability of the people to maintain their national

CHINA'S STANDARD BEARERS AT WASHINGTON

Alfred Sze

Wang Chung-hui

Wellington Koo

world affairs. In the face of existing conditions her delegates sought to impress upon the conference that China stands upon "the same plane in respect of law and justice as do the most advanced and most intelligent of Western states." Especially was this so in Minister Sze's admirable presentation of China's case and her demands for an immediate release from all impairments and limitations upon the "autonomous, unembarassed exercise of her territorial administrative powers." Which influenced *The Times* (*London*) to call him to earth in the following terms :—

"The arguments by which the Chinese delegate supported his fresh demands were skilfully adapted to the minds of Western democracies, who fondly believe that a government represented by so plausible a speaker must in all that is essential resemble their own. This effort to establish that all his new demands are the inevitable consequences of principles which the committee have adopted, and that the members cannot reject them without stultifying themselves, was framed and pressed with an adroit perception of popular ignorance and of popular sentimentality that does him infinite credit, and the way in which he introduced the question of Manchuria is dexterous. But the part of his speech in which he surpassed himself was in his grave appeal to his colleagues on the commission to reflect what their feelings would be were encroachments like those of which he complained made upon the sovereignty of their own countries." "Your feelings of justice and your sense of the dignity due to your State," he told the representatives of the United States, of England and of Japan, "would in such a contingency make evident the propriety of a claim such as China now advances. The rights of exclusive territorial jurisdiction, in international law and in the general sense of international comity and justice, manifestly attach to the status of sovereignty and independence. Yet these rights are being infringed in the case of China. Nothing could be more plausible, and nothing, as many of Mr. Sze's hearers knew, and as he knew they knew, could be more independence and the handing over of the country to the free-booting tuchuns which show

"that the Chinese representatives at Washington have a dubious status. They may speak for the Peking government, but it does not appear that the Canton government, or the general body of provincial governors, recognize them. They show also that even with the goodwill of the great powers it is a very moot point whether China is capable of governing herself. And a country in such a chronic state of weakness and disorder tends to become a prey to stronger powers, even though such powers may not desire to interfere in its affairs. We have to recognize the plain teaching of history, that as many wars have been caused by weakness as by strength. A government that cannot maintain law and order, and is acknowledged in only a small part of the territory over which it is supposed to rule, is a standing menace to itself, and a target for all its neighbors. This is the present condition of China, and were it to continue it would be extremely difficult for Japan and other powers to adopt the rôle of disinterested spectators."

In regard to Minister Sze's demands for the withdrawal of foreign troops from Chinese soil and the abolition of any and all impairments of China's sovereignty, the *Sussex Daily News* (*Brighton, England*) says :

"Acceptance of this demand would, of course, render any discussion of a Chinese settlement entirely superfluous ; it would simply mean handing over the whole matter to China to decide. Whatever may be said of the abstract justice of such a course, it is clearly not a practical proposition. It would hardly be practicable even if China were a united and well governed country, and her delegates could claim to speak in the name of it. As things are, it is little short of preposterous. We trust that this resolution will promptly be dropped, and that the Chinese delegates will descend to the mundane plane of those realities which it is the business of the conference to discuss and, if possible, to adjust."

Lt.-Col. Repington, the military correspondent of *The Times*, lost his temper when it appeared that the Chinese delegates might resign or bolt the conference and sent the following dispatch to his paper:—

"There is much talk of dissensions in the Chinese delegation and of the departure of some or all of the delegates from Washington. The world will not come to an end if they go nor will the work of this conference be deflected from its course, but it would be well for the Chinese to understand that they can only get what they want or are said to want by their supposed representatives when they re-establish order and create the services needed for an efficient administration. It will be only of disservice to China if the powers represented here leave China with confusion worse confounded."

The Morning Post (*London*) also scores the Chinese for their attempt to convert the conference into a clearing house for domestic politics and says:

"The difficulty of dealing with the Chinese has again been demonstrated. Four of the most prominent advisers of the Chinese delegation have resigned and refused to have any further association with the conference. They give as a reason that their delegates are sacrificing the interests of China, and that Great Britain and the United States, instead of standing out for the protection of China against Japanese rapacity, have yielded everything to Japan and will leave her more strongly entrenched than ever. These are the assigned reasons, but the real reason, it is believed, is the struggle for supremacy between the so-called governments of the North and the South, and Washington is being made an arena of Cantonese and Pekingese intrigue.

"The attitude of China is so unreasonable that she is rapidly losing all sympathy. There is a genuine desire on the part of all the powers to help China. Japan, from all accounts, has been reasonable and conciliatory, but China asks impossibilities and her pretensions are absurd. China has been given a golden opportunity at this conference and she does not recognize it."

It remained for the *New York Herald* to read the Chinese a friendly lesson as to American ideas on her welfare, and clinch the many criticisms of other prominent newspapers in England and the United States. The *Herald* places the facts fairly before China in the following terms:—

"Not once or twice but many times this country has gone out of its way, far out of its way, in behalf of the interests of China. America is still the stanch friend of China. China is at the conference because of the insistence of America. America desires for China, and is diligent in seeking for China, the best and the most that can be achieved for her. But now, as for a long time, there are realities which must be faced by China, by America and by the world in working out the problem of China.

"China wants control of her own transportation lines. She should have it when and where it is possible. She wants an end of exterritorial jurisdiction. Everybody hopes she will get it. She wants no international financial control. That were scarcely possible without her consent and voluntary co-operation. All the world as well as China herself wants to see her borders replaced where they belong and where they will no longer offer a temptation to swashbuckling imperialism.

"But who is going to achieve this emancipation for China? She admits, and her history shows, she cannot do it for herself. No one power, no two powers and no segregated groups of opposing powers can strike from her hands at one stroke the ties that bind her politically and economically.

"China cannot control her transportation lines unless she finds a way to build them for herself. She cannot build them for herself unless she has the aid of outside capital, and this she cannot get while there is danger that the capital might not be repaid or that the railroad might pass into control of some foreign power.

"China cannot abolish exterritorial jurisdiction until she has courts of her own capable of trying cases which involve foreign nationals. She cannot, to any good purpose, set up those courts until an agreement has been reached among the nations formerly enjoying exterritorial rights that they will abide by the decisions of the new tribunals.

"China wants no international financial control; she can escape it only by throwing off the old indifference as to how, by whom and for what purpose money shall be lent to her. She has been financed in geographical sections until there is neither head nor tail to her fiscal system."

"If a conference in a foreign land were to discuss what was to be done about American courts, American railways and American finance we should of course regard it as insufferable, even if we were invited to send delegates. But in China's case no issue of propriety can be raised. She is, as she should be, represented at the Washington conference because the United States demanded that she should be represented there. China has more to say in this discussion than she has ever had to say in the private negotiations and international intrigues concerning her in the past.

"All this will be considered by China and by the world as the conference tries to work out the solution of her problems."

It is with deep regret that Americans and British editors have been compelled to read the riot act to China who came into the conference of armed nations only because the United States willed it, so that her case might be aired and the causes of international strife removed. The conference was not a court for the trial of Japan. It was an effort on the part of the United States to find some way whereby the Anglo-Japanese alliance could be superseded by some workable instrument that would bring peace to the Pacific and in time stability to China. At all times China was the recipient of favors, and was, through American support placed in a strong position, brought face to face with all the nations interested in the Far East, with their representatives disposed to do everything possible to aid in restoring China's integrity and rehabilitate her finances. China unaided could never have brought about such a conference, and without the moral support of the United States could not have achieved what she did.

For the Chinese to even hint that they might bolt the conference, meant that it would throw upon the United States the task of acting as trustee for their affairs, placing us in a most embarassing position *vis-à-vis* the other powers. The attempt to override the Versailles Treaty relying upon America to stand by them, reflected little credit on the intelligence of those who demanded its reconsideration at the conference. The attempt to hold Japan up as a militarist nation, despite the many great concessions she was prepared to make to regain China's friendship, when persent day China is in the hands of the worst crew of freebooting militarists that has disgraced the pages of modern history, leaves a bad taste in the mouth. Japan's militarists exercised no influence on the conduct of their delegation at the conference. They, at least, have guided Japan to the front rank of world powers, while the militarists of China have deprived the country of its good name, its credit and standing, exposed it to the ridicule of the entire world, a suppliant for justice.

All honor then to Sze Chao-chi, of Cornell, to Koo Vi-kyuin of Colombia and Wang Chung-hui of Yale who stood alone reflecting the highest American and Western ideals of justice on behalf of a people whose rulers had no claim to a seat at a conference of the powers. They scored a success, a victory that their countrymen should be proud to honor them for. It is necessary to emphasize this, for already the vanguard of the disappointed ones are returning to China spreading the story that China has been betrayed, that the delegation has failed, that once more China has been humiliated and Japan lifted up to prominence.

If any defeat is to be registered, it is not China's official delegates who must stand the blame. The onus of failure must be borne by those responsible for China's defeat at Paris, those advisers and others, who enticed her to the highest pinnacle of hope only to dash her over the precipice and hurried home to justify their action by clamoring for war with Japan. The only failure registered at the Washington conference was on the part of those who persisted in concentrating their fire upon Japan, striving to discredit, isolate and drag her to trial before the court of world opinion. They failed. China and the world will do well to forget them. If the results of the Washington conference are to bring strength and stability to China, she must face the future with a new outlook. She must accept Japan as a friend, for only in this way can the other partners of Japan be of assistance to her. China refused to heed the lesson of the consortium in that Japan and America were the only two nations that had the money to lend her for reconstruction purposes. Unless there was the most complete accord and harmony between Japan and the United States, China could hope for no outside financial assistance. What held good two years ago, holds good to-day. The American people are tired of this incessant nagging of Japan. They want to be friendly with her, co-operate with her and together with the other consortium powers, lead China along the path of true greatness and prosperity.

China's false friends, have had their day. Unless we are very much mistaken their usefullness is finished. Their further employment by China to continue an agitation that has been frowned upon by the best element in the United States will be the one thing that will prevent her from enjoying the fruits of the conference. China has a brilliant future ahead of her. All her friends, stand ready to help to push her along. China will be well advised to turn a deaf ear to those who preach that she has been defeated, and remain well content with the brilliant victory of Sze, Koo and Wang until such time as she gets once more on her feet, and can, with propriety establish her claims to further concessions.

Odagiri Defends Lamont

As disclosed in the January Number of The Far Eastern Review, the attempt on the part of Mr. Lennox Simpson to impugn the integrity of J. P. Morgan & Company in the matter of the German Hukwang bonds held in America, and through this firm, the consortium as a whole, was immediately resented by Mr. Thomas W. Lamont, who not only clearly stated the facts in regard to the possession of these bonds but found occasion to pay his compliments to the pernicious activities of those who would create suspicion and stir up trouble between Japan and America. In view of this and other efforts on the part of China's advocates to discredit the consortium, Mr. Mannosuke Odagiri (representative of the Japanese banking group in the consortium), in Washington as the financial adviser to the Japanese delegation came to the support of Mr. Lamont in a public statement issued to the press on December 18.

Mr. Odagiri upheld the attitude of Mr. Lamont in insisting that China should pay interest upon the Hukwang bonds of German issue which had come into the possession of Americans.

Mr. Odagiri denied the statement recently made by "Putman Weale," the effect of which was that China had repudiated the German issue of the Hukwang bonds at once upon the declaration of war against Germany. Mr. Odagiri said that no such repudiation was made until some time after war was declared and that therefore these bonds might naturally and properly come into the hands of Americans inasmuch as the repudiation was not announced with the declaration of war. Mr. Odagiri thought it was proper that the American holders of the Hukwang bonds should be paid, as contended by Mr. Lamont.

Mr. Odagiri said he was influenced in making his statement because of the controversy which had been under way between Mr. Lamont and Mr. Simpson.

Object of the Consortium

"The present consortium, as Mr. Lamont has recently written," said Mr. Odagiri, "was formed at the instance of the governments of the United States, Great Britain, France and Japan, with a view to ending competition in the furnishing of public funds to China. The object of creating friendly co-operation among the bankers of these countries was with the hope that this action would contribute to the restoration of a healthier and more stable economic and financial condition in China. When these four countries saw that China was in serious financial difficulties, they got together in an effort to help her avoid what might become a calamity. Other nations have been wrecked by unlimited borrowing and it was desired to save China from such a fate.

"Under existing international handicaps, the Chinese government has been unable up to the present to extricate the country from its difficulties. Some of the government officials have not exemplified the traditions of honesty which made the Chinese merchants of the nineteenth century notable in their dealings with foreigners. The record of Chinese credit, up to recent time, is one of the best examples in history of the highly profitable character of a reputation for honesty, though the integrity of the merchants has not extended fully to the governing classes. The moment it should become clear that money lent in China would be honestly and effectively used, the need for precautions on the part of foreign bankers and foreign governments would disappear.

"No nation alone could furnish the capital for China's gigantic construction and re-organization needs. In the case only of communications the requirement is for billions of dollars. There are approximately only 8,000 miles of railway in China, though her territory is considerably larger than the United States and the population is believed to be four hundred millions. In the United States there are over 270,000 miles of railway.

Must be Absolutely Secure

"Loans of such size as China's needs involve are not made by capitalists. The capitalists only underwrite them for disposal to investors. The bonds cannot be sold successfully unless they are absolutely secure and the income from them is attractive. A prime requisite for such security is a condition of respect for property rights.

"It will be noted that so far the consortium has made no loans to China. A prime rule of the consortium is its purpose to lend money to Chinese governments (central or provincial) for only the larger economic development work of strictly public character, and only on the request of such governments. The consortium refrains strictly from commercial or industrial financing, with which it has nothing whatever to do, and therefore it can hardly be described as exercising a monopolistic control of loans in China.

"The requirement by the consortium of supervision of the receipts and expenditures involved, as security for loans made by it, is strictly in accordance with usual banking practice. It is not for the purpose of securing control of China's finance, but to obtain the customary protection for investors in the loan. They must be assured that the property for whose development their money is borrowed is to receive the maximum benefit from the money, so that the security shall be increased in value and the means for repayment shall be provided. In this case the property requiring development is China, and its managers, the government, should welcome the advice, co-operation and expert book-keeping which the bankers offer for the benefit and protection of both the management and the bondholders. Without such protection it will be impossible for China to borrow large sums of money.

Welcomed Chinese Group

"The organization of the Chinese banking consortium, which was formed last year, was welcomed by the international consortium, and it is to be remarked that this association of Chinese bankers has adopted in practice exactly the same attitude in lending money as that of the foreign group, namely, it has demanded from the Chinese government satisfactory assurance that the money borrowed shall be spent for the purpose for which it is lent and not applied indiscriminately to 'administrative' purposes, for current expenses or maintenance of the various needlessly large provincial military establishments. The two groups of bankers, Chinese and foreign, are in accordance as to purpose and method.

"This is particularly interesting because of the latent financial power in China. There is money there and there is adequate banking machinery to provide funds for government financing. But that power has been withheld by the Chinese bankers and business men because they could hitherto get no satisfactory assurance that money lent to the government would be either used legitimately or repaid when it became due.

"It cannot be too strongly emphasized that the consortium does not seek and does not desire that control of China's finance. It cannot gain such control so long as it follows the principles to which it is committed. And it never has interfered and never will interfere with private financing. The consortium seeks only to help in the establishment of China's financial situation on a sound basis—from which the Chinese will be the first and greatest beneficiaries."

Shanghai Harbor Investigation

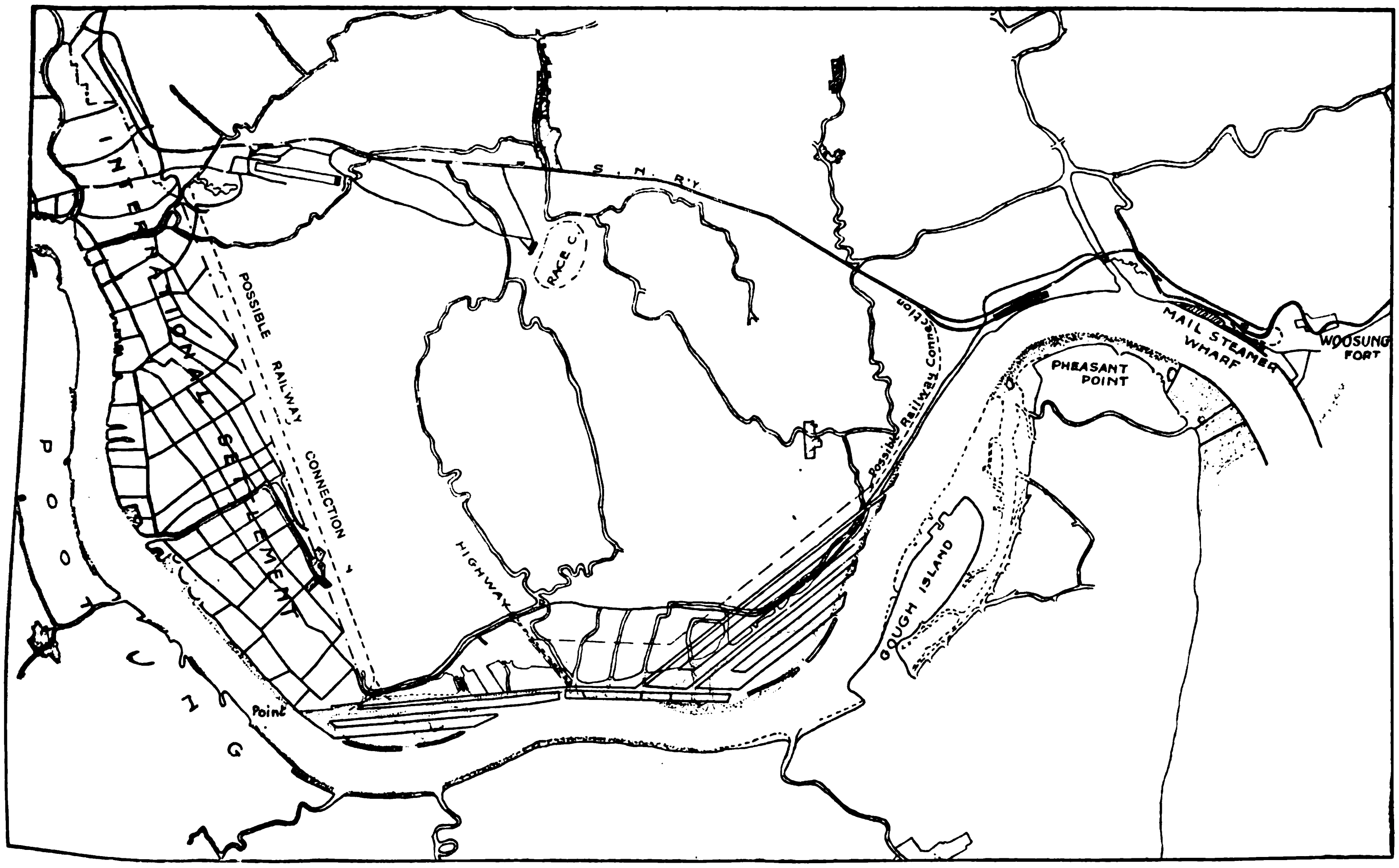
Full Report by the Committee of Consulting Engineers

I. Preamble.

1.—The importance of Shanghai as the commercial gateway of Central China is too well known to need more than the briefest reference in this report. Situated as it is within a few miles of the mouth of the Yangtze River, on the banks of the tributary river Whangpoo and protected by its position against serious danger from typhoons, it is eminently suitable as the distributing port for the commerce of the rich and densely populated basin of that great river, which spreads westward across the whole width of China. In the delta of the Yangtze an area of nearly 50,000 square miles supports a population of over forty million people which is directly dependent on Shanghai, and in the whole watershed of 750,000 square miles the population is one hundred and eighty millions, or more than one-tenth of the inhabitants of the whole world.

2.—In no other part of the world does a population of this volume and density depend for its commercial intercourse upon one main river and one distributing port. For a thousand miles the Yangtze is navigable for river steamers. Hankow, six hundred miles from the sea, is accessible at all times for steamers of 2,000 tons, and during the summer months for vessels up to 8,000 or even 10,000 tons. Throughout the great alluvial plain innumerable waterways form a network extending in all directions, even as far north as Peking, and act as feeders to this mighty waterway for the traffic on which Shanghai is the natural point of distribution.

3.—The gross trade of the port of Shanghai, which in 1920 reached a value of Hk. Tls. 840,000,000, not including transhipments declared for other ports, increased during the period 1900-1913 at the rate of Hk. Tls. 20,000,000 per annum. In 1920 the annual increase compared with that at other great ports of the world is found to be normal, and it seems probable that the pre-war rates of increase will continue. It is certainly very conservative to estimate that the increase in bulk of cargo and in tonnage entered in ten years will be at least 33 per cent. Thereafter the increase is likely to be still greater. It has been possible hitherto to accommodate the trade offering itself, but the growth during recent times in the size and draft of ocean steamers brought about by the need for cheaper transport now makes it incumbent on Shanghai to provide in progressive measure for larger vessels as well as for expanding trade. It is essential that the facilities of the port shall keep pace with the requirements of modern transportation. It can be said safely that, given adequate facilities, the potentialities of Shanghai's



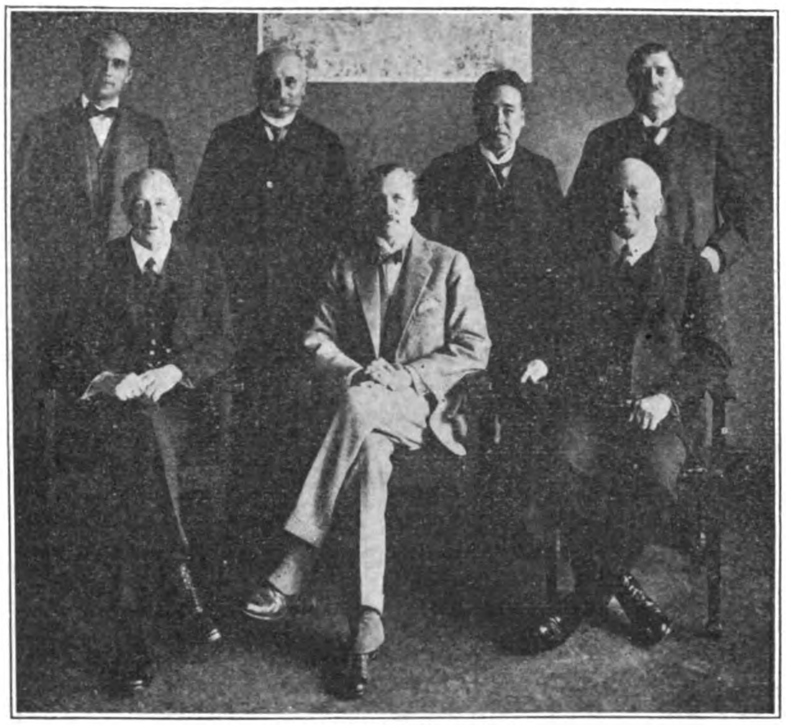
KEY PLAN OF THE WHANGPOO

The Plan here shown of Basins forming the Commercial Wharf and Dock Harbor is a mere indication of possible Development of Available Sites Adjacent to Shanghai. The Actual Layout is a matter for detailed study in the future.

Commercial Wharf and Dock Harbor	Berthing Space Proposed for Immediate Construction	2,500 feet
	Possible Future Berthing Space	57,000 „
Mail Steamer Wharf	Berthing Space Proposed for Immediate Construction	600 „
	Possible Future Berthing Space	6,000 „

enormous and densely populated hinterland, served as it is by probably the most extensive system of waterways in the world, with cheap transportation for both the requirements and the products of the country, afford indisputable indications that the growth of trade will continue.

THE COMMITTEE OF CONSULTING ENGINEERS



FROM LEFT TO RIGHT

First Row (sitting): Maj.-General W. M. Black, Mr. H. von Heidenstam (Chairman) and Mr. F. Palmer

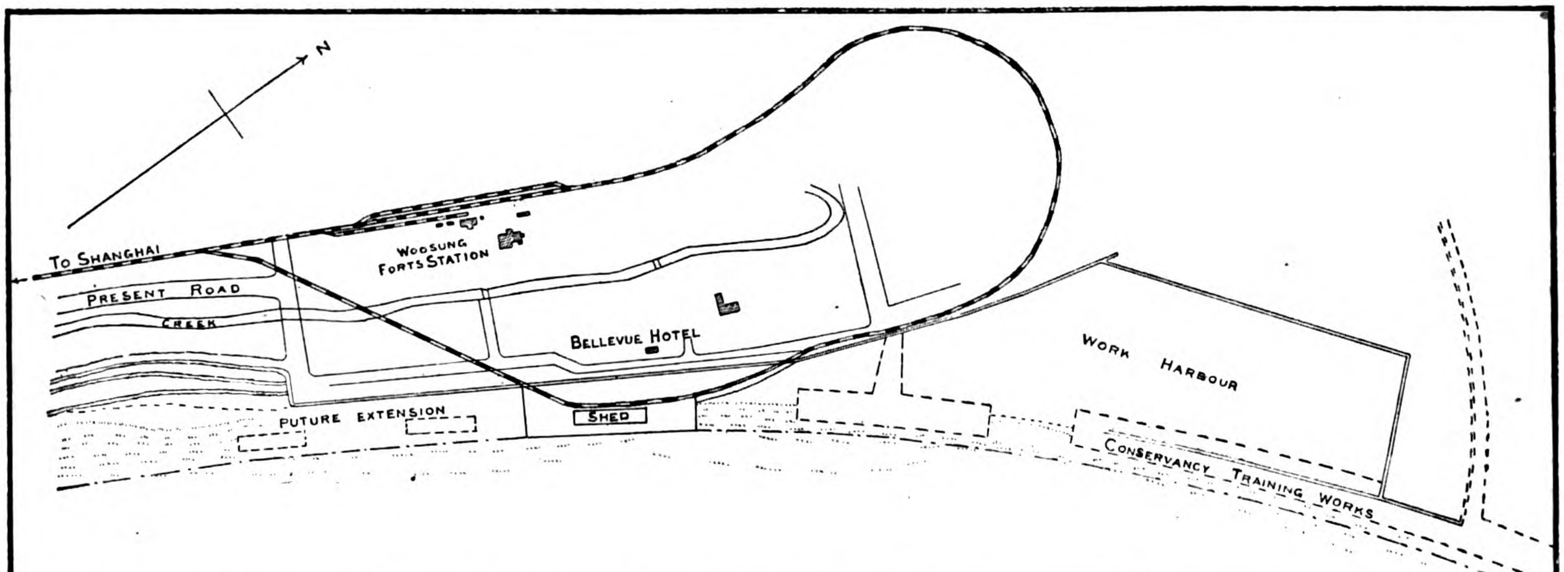
Second Row: Mr. P. G. Hornell, Mons. L. Perrier, Dr. I. Hiroi and Mr. P. Ott de Vries

4.—Up to the present time accommodation in the port has been provided by individual enterprise on the part of the merchants, but, as in all other great ports, development must eventually depend upon collective effort because it is only by this means that improvements in facilities of a general nature, such as the deepening of the approaches, can be brought about. Within the limitations of their powers and of their means the Whangpoo conservancy board have commenced and effected very great improvements in the Whangpoo, but the time has arrived when the approach must be developed as a first-class waterway. Not only must the navigable channels be made to conform to the requirements of modern vessels but many other improvements are equally essential. Additional and deeper wharf frontage, more godowns for the storing of goods, more effective means for the handling and transhipment of cargo, and the extension of the harbor limits to permit of adequate control, are all necessary for the trade of the future and for reducing the cost of dealing with that trade. Whether the existing board are to be given powers to carry out these requirements, or a new board constituted to perform these duties, it is obvious that no time should be lost in creating powers to develop and administer the port as a whole.

5.—The Whangpoo conservancy board have had the Shanghai harbor question under continuous consideration since 1916 and, in addition to their scheme of improving the approaches through the Yangtze, have formulated various projects such as a ship canal to Hangchow Bay, a "*port de vitesse*" on Hangchow Bay, the damming up of the Whangpoo, etc. They have also obtained advice from several consulting engineers on the problems involved. Schemes have also been put forward by outside persons, and, finally, a number of projects have been sketched out and considered by this committee during their session. It is therefore believed that no serious possibility for the solution of the Shanghai harbor question has been overlooked by the committee. It is considered unnecessary to go into these many schemes here or to give all the reasons for and against each one of them. The main proposals hereinafter made are considered manifestly preferable to the other possibilities and no doubt exists in the minds of the committee as to their general suitability. The investigations made show that it is possible to overcome all the deficiencies under which Shanghai now labors, at a cost not incommensurate with the benefits to be obtained. Adequate depths can be secured in the approaches and in the harbor itself as and when required; additional and improved wharf accommodation can be provided and efficiently equipped in small units as it may become necessary; the co-ordination of control can easily be effected without detriment to existing interests; all provided the government will, in the interests of the Chinese people, who in the end will mainly benefit, delegate the necessary powers to a competent body.

6.—For the extension of the harbor accommodation the committee are convinced that while it is necessary to provide for some of the steamers at the mouth of the Whangpoo, it is essential that the new wharfage should be situated as near as possible to the present trade centre and that it is desirable for economical working and control to concentrate this development so far as the available sites permit.

7.—With these ends in view the committee in this report make recommendations covering: (*a*) the outlines of a general scheme for continuous future development, and (*b*) the improvements which can be effected without extraordinary outlay to meet immediate needs.



MAIL STEAMER WHARF PLAN

In arriving at the conclusions they have reached, the committee have given the greatest attention to the necessity for limiting the expenditure proposed within the capacity of the trade of the port to pay for such improvements. It is abundantly clear to them that whatever may be the improvements which must be carried out the cost will have to be borne by the trade. Nothing must be done so to burden the commerce of Shanghai as to prejudice the existence of that trade or to stunt its growth, and it is firmly believed that the committee's recommendations are commercially sound. The slight increase of taxation which has to be imposed to meet the cost will be amply repaid by the increased value of the facilities and the economies which will be effected in transportation and in the handling of the goods carried. Without the improvements aimed at by the works proposed, it is obvious that the trade carried in deep draft ships will gravitate to foreign distributing centres and that Shanghai will become a second-class port with consequent great loss not only to local interests, but also to China as a whole.

II. Draft of Ships.

8.—The committee are of the opinion that the trade of the Pacific will in the future be carried in vessels of greater draft than those at present in use, and that in a few years a draft of 33 feet may be reached in the larger vessels for which accommodation will be required in Shanghai. The committee do not consider it advisable to provide at present for anything beyond this draft. Therefore the committee propose a first improvement in depth to such a degree that within a few years ships of 33 feet draft will be able to enter at neap high tides. The methods proposed will afford a progressive increase of depth. A further increase, if required in the future, can be provided for by extending the operations.

III. Approaches.

(See Drawing No. 1.)

General Scheme.

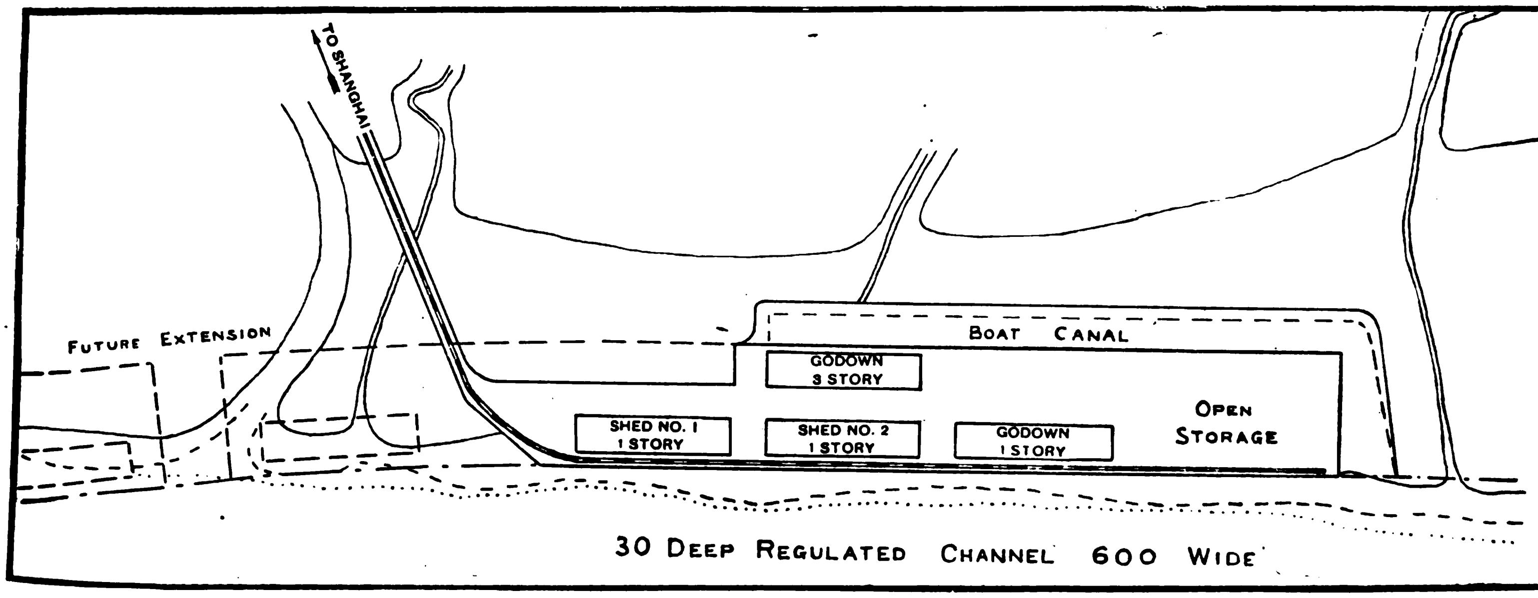
9.—(*a*) *Selection of Approaches:* After consideration of the Yangtze estuary as a whole, the tidal phenomena, the fresh water discharge, the silt-contents, other information available and the reports already made, the committee are convinced that the south channel lends itself most readily to improvement and that the work of obtaining a greater depth should be undertaken along this channel. (*b*) *Regulation:* The committee are of opinion that deepening in the south channel should be undertaken by dredging only, at least in the first instance, and that by this means there is a reasonable prospect of permanent improvement. (*c*) *Observations:* The committee consider that extensive and continuous observations should be carried on in the estuary to provide further information for river engineering purposes, in addition to that available from the navigation charts which may be published from time to time by the Chinese maritime customs.

Immediate Requirements.

10.—The committee recommend that the harbor authority should proceed: (*a*) to carry out forthwith the river engineering observations indicated under 9 (*c*), General Scheme; (*b*) to make and maintain a channel through the fairy flats, developing it gradually foot by foot, to as great a depth and width as required and possible, and to provide as soon as feasible a channel of 600 feet bottom width for the passage of ships drawing 33 feet at ordinary neap high water;

As the mean ordinary neap high water level is 28 feet above the present crest of the fairy flats, and allowances of 3 feet for clearance, wave action, etc., and one foot for the fall of tide during the ship's passage are necessary, this means the attainment of a depth at neap high water of 37 feet or a deepening of 9 feet on the crest.

(*c*) to hire or acquire—whichever is more economical—for the purpose of carrying out this work at least two dredgers of the most powerful type which can be operated on the fairy flats in a depth not exceeding 18 feet; (*d*) to carry out any auxiliary works which may be necessary; and (*e*) to consult the Chinese maritime customs as to the provision of marks and of a first-class depth signalling arrangement at the bar.



COMMERCIAL WHARF AND DOCK PLAN

IV. Harbor.

(See Drawing Nos. 2, 3 and 4.)

General Scheme.

11.—The committee recommend that: (*a*) public quays and moorings be provided; (*b*) a commercial dock, of the open type in the first instance, be provided on the left bank of the Whangpoo, as near Shanghai as practicable and that mail steamer accommodation be arranged, also on the left bank, near the mouth of the river, both works to be designed to admit of further extension as and when required; (*c*) existing foreshore areas and conservancy land be utilized as far as possible for harbor purposes and sufficient adjacent land acquired for future development; (*d*) the Whangpoo regulation be continued to whatever depth may be required and possible to obtain; and that (*e*) cross river communication be by ferries.

Immediate Requirements.

12.—To meet immediate needs, the committee recommend that: (*a*) the engineer-in-chief's "General Work Program" of April, 1921, for the further regulation and maintenance of the Whangpoo be carried out with certain reservations, namely: (1) dredging only should be employed in the first place as a means

of improving the fairway depth to 30 feet at lowest low water; (2) all areas between the old high water lines should be reserved under the board's jurisdiction for potential harbor, industrial and other purposes; (*b*) a wharf 600 feet long be constructed on the left bank near the mouth of the Whangpoo for mail and passenger steamers; (*c*) berthing 2,500 feet in length be provided at once for four or five vessels at suitably equipped riverside wharves with transit sheds, godowns, canal frontage for small craft, and provision for rail connections when required; (*d*) the existing river moorings be acquired and added to as required; (*e*) in the meantime projects be developed for more extensive accommodation in basins, the construction of which should be carried out as and when required; (*f*) as an essential, all the necessary land be acquired at once; and that (*g*) all these immediate and future works should be provided and administered by the harbor authority.

V.—Estimates for Immediate Requirements.

Capital Expenditure.

13.—The immediate measures outlined above have been estimated to involve capital expenditure in connection with plant and construction costs approximately as follows:

Improvement of Approaches:

	Sh. Tls.	Sh. Tls.
Survey Plant:		
Sea-going survey ships, pinnaces, beacons, instruments, etc.	200,000	
Dredging Plant:		
Two powerful dredgers, auxiliary plant, coal barges, tugs, mark buoys, etc.	4,200,000	
Incidental Plant:		
Small tow-boats, work yard and other appurtenances	125,000	
		4,525,000

Harbor Work:

Plant for Whangpoo Regulation	725,000	
Commercial Wharf and Dock:		
2,500 lin. feet of public wharf		
3 transit sheds, 120′ by 500′		
Godown, 3-story (120′ by 500′).		
Open storage, 360,000 sq. ft.		
Lighter and native craft accommodation 100′ by 1,800′		
Appurtenant terminal works, such as railway, roadway, paving, mechanical equipment, lighting, etc.		
Total cost including interest during 3 years' construction period	4,500,000	
The capacity of the wharf as outlined above is 500,000 tons per annum, but in estimating revenue a wharf capacity of 350,000 tons only has been taken.		
Mail Steamer Wharf		
600 lin. feet of wharf.		
Transit shed 50′ by 250′		
Appurtenant rail, roadways, paving, lighting, etc.		
Cost with accrued interest during construction period	620,000	
The capacity of the mail wharf is at least 200 berthings per annum, but in estimating revenue only 100 berthings per annum have been allowed for and a tonnage of 80,000.		
Purchase of 19 Moorings	380,000	
		6,225,000
Total Capital Cost... ...		Sh. Tls.10,750,000

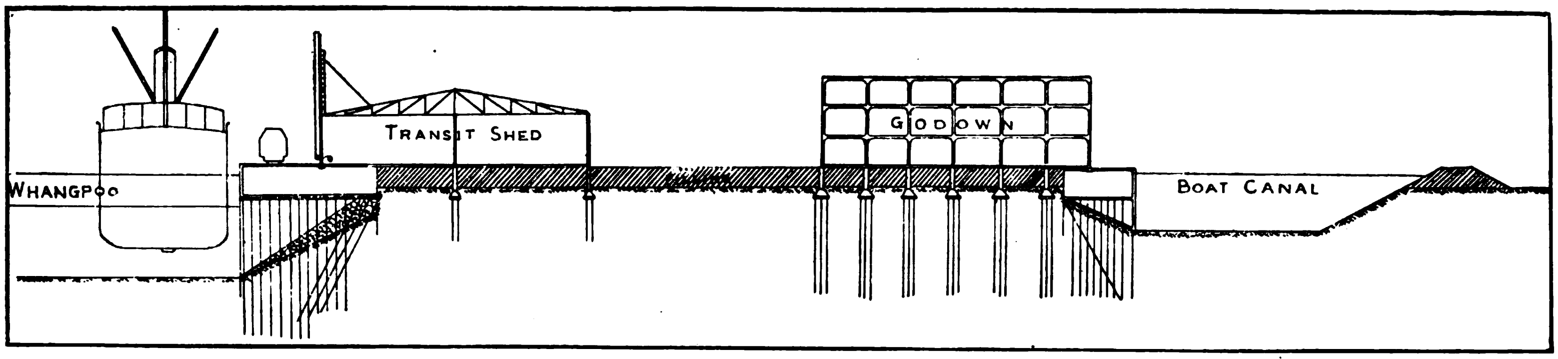
Annual Receipts and Expenditure.

14.—A statement of annual receipts according to the taxation, detailed in Section VI under "Finance," based on 1921 trade figures, together with the estimated revenue from harbor utilities and of estimated expenditures is given below in the form of a working account:

EXPENDITURE.

	Sh. Tls.	Sh. Tls.
General Expenses:		
Improvement of Approach—		
Survey	100,000	
Dredging	1,000,000	
		1,100,000
Harbor Expenses:		
Whangpoo Regulation	531,000	
Commercial Wharf and Dock (2,500 lin ft.)		
Dredging	25,000	
General maintenance	12,000	
Working costs	120,000	
Mail Steamer Wharf (600 lin ft.)		
Dredging	4,000	
General maintenance	2,000	
Working costs	16,000	
Moorings—		
Maintenance	9,500	
Working costs	2,000	
		721,500
Interest Charges—		
Port Debentures 11,020,000 @ 8%	881,600	
Sinking Fund @ 1½%	165,300	
		1,046,900
Balance, surplus		4,100
Total Expenditure...		2,872,500

Note.—The present annual expenditure will gradually increase as further duties are undertaken and capital works are carried out, until, at the completion of the "Immediate" program, the figures of expenditure shown in this statement may be reached.



COMMERCIAL WHARF AND DOCK SECTION

REVENUE.

	Sh. Tls.	Sh. Tls.
General Income:		
Conservancy tax (net) 6 per cent. on customs duty (approx. 0.3 per cent. *ad valorem*) ...	1,610,000	
Transhipment tax at 0.15 per cent. *ad valorem*...	150,000	
Tonnage dues	370,000	
Permits for work, say	3,500	
Shengko receipts, say	26,500	
		2,160,000
Harbor Earnings:		
Commercial Wharf and Dock (2,500 lin ft.)		
Cargo	350,000	
Berthing	75,000	
Godown storage	180,000	
Mail Steamer Wharf (600 lin ft.)		
Cargo	60,000	
Passengers	10,000	
Berthing	9,000	
Moorings	28,500	
		712,500
Total Income ...		2,872,500

Note.—The revenue, based on 1921 figures, given in this statement will be greater from year to year owing to the constantly increasing value of trade. The conservancy tax at present contemplated is only 6 per cent. while the powers proposed allow of 10 per cent. on the customs duty, so that not only will the surplus be greater than shown but there is also a reserve of taxation amounting to over 1,000,000 taels per annum. In the same way, the transhipment tax estimate is only 60 per cent. of the amount authorized.

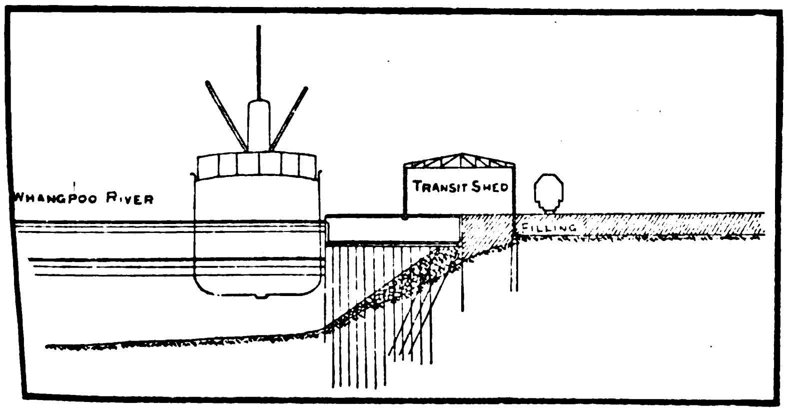
15.—The following table shows against the capital requirements the program by which the funds may be raised by means of port debentures :—

Funds to be Raised.	Sh. Tls.	Sh. Tls.	Capital Requirements.	Sh. Tls.	Sh. Tls.
Port Debentures :			Approaches :		
1st Year ...	2,050,000		Survey plant ...	200,000	
			Dredging plant....	4,200,000	
2nd ,, ...	4,100,000		Miscellaneous expenditures ...	125,000	
3rd ,, ...	4,870,000				4,525,000
		11,020,000			
			Harbor :		
			Plant for Whangpoo regulation	725,000	
			Commercial wharf and dock ...	4,470,000	
			Mail steamer wharf ...	650,000	
			Moorings ...	380,000	
					6,225,000
					10,750 000
			Flotation expenses ...		270,000
		11,020,000			11,020,000

In regard to capital requirements the table above relates only to works still to be provided. The new board would, however, take over tangible assets in plant, property and cash to the value of over Tls. 1,000,000 and in addition the works executed in deepening and improving the Whangpoo River which are estimated to have cost Tls. 10,000,000 excluding maintenance. Therefore a capital reserve of over Tls. 11,000,000 stands to the present credit of the Whangpoo conservancy board.

VI. Administration and Organization.

16.—The further general port development required at Shanghai cannot be made within the scope of the powers now vested in the Whangpoo conservancy board. The realization of the essential parts of the committee's recommendation will therefore depend upon putting into effect an administrative scheme, providing an executive organization having the necessary authority and with power to raise funds.



Mail Steamer Wharf Section

17.—The formal reference of this question to the committee requires a definite reply, and after careful consideration of the local conditions in comparison with those of the many other ports of the world with which the various members have been associated, the committee are of opinion that the requirements can be met only by the revision of the existing Whangpoo conservancy agreement of 1912 and the expansion of the present board into a new body, which might be known as the Shanghai harbor board, with more extended powers and more directly representing shipping and trade interests. It has been proved beyond doubt that port growth and efficiency are best developed where the governing body includes representatives of shipping and trade interests as well as government officials.

18.—The technical schemes recommended by this committee are of two classes :

non-revenue producing, *e.g.*, the improvement of the approach and of the channel of the Whangpoo ;

revenue producing, *e.g.*, harbor utilities such as public wharves, moorings, etc.

19.—The committee have carefully considered all the sources of revenue and consider that while the operations under the second class may be reasonably expected to be self-supporting, it will be necessary to exploit other sources of revenue to pay for the services required under the first heading.

The conservancy tax, at present three per cent. of the customs duties, is no more than one-eighth of one per cent. on the actual value of the trade. To raise this taxation even to one-half of one per cent. *ad valorem* would be an increase quite insignificant as compared with the every-day fluctuations in business conditions, such as cost, freight or exchange.

Cargo transhipped in Shanghai, but declared for other ports, contributes nothing at present to the revenues of the port, the only charge upon it being the tonnage dues imposed for general coast lighting and other aids to navigation. There would be no hardship in imposing a transhipment tax on this transhipped cargo not exceeding one-half of that on cargo passing through the customs. Some difficulties might occur in levying it, but by the imposition of bulk rates these may be overcome.

As to tonnage dues, there are several precedents in China for an additional due being collected for harbor or conservancy purposes.

The committee gave considerable study to the subject of wharfage dues on cargo as now levied by the various municipal bodies, in addition to the regular municipal taxation and rates on riparian properties, and came to the conclusion that merchants and shippers are already charged in this respect to an extent which does not warrant any further increase.

20.—The committee have formulated their recommendations on administration and organization under six headings : Constitution — Jurisdiction — Powers — Duries — Finance — General, in such a form that they may be embodied in a new scheme for the management of the port, as outlined on the following pages :—

Constitution

21.—(1) The board shall consist of : (*a*) Chinese officials, including local representatives of the customs and railways, appointed by the government, one of whom shall be chairman ; (*b*) representatives of shipping and trade in Shanghai elected by local interests and also to a limited extent representatives of municipalities ; (*c*) a general manager, appointed by the board, who shall be, *ex-officio*, vice-chairman. (2) The members under "(*a*)" shall hold office as long as they fill the positions by virtue of which they sit on the board.

When the board are first organized the term of office of one-half of the elected members shall be one year only, the selection to be determined by themselves, and one-half two years ; thereafter the term of office shall be two years. (3) The several members of the board have, as such, equal authority, and the opinion of the majority is to be determinative. In all meetings of the board, if votes are equally divided, the chairman shall have a casting vote. A majority of the whole number of members shall form a quorum.

Jurisdiction.

22.—(1) The general jurisdiction of the board shall extend : (*a*) in the Whangpoo, from its junction with the Yangtze to the tidal limit and laterally between the high water lines of ordinary spring tides. Highwater of ordinary spring tides is defined as twelve and one-half feet above Woosung datum. Within these limits no operation which in the opinion of the board may affect the regimen or navigability of the river shall be undertaken without the board's consent, nor without such consent shall wharves, jetties, pontoons, hulks, etc., be established : (*b*) in the approaches,

from Saddle Islands to Plover Point (the 121st meridian east of Greenwich), in so far as concerns the work of hydrographic survey and the improvement and maintenance of the approach channel: (c) over such areas as may be acquired for harbor purposes. (2) The harbor shall consist of the Whangpoo River, from a line drawn square to the river from the upper side of the entrance of the Yang Shih Chiao Creek above Lunghua, down to the mouth of the river, including all public wharves and areas devoted tc public purposes and provided by the board, and also of the Woosung anchorage in the Yangtze River.

Powers.

23.—(1) The authority vested in the board is delegated to it by the Chinese government, and the board are in no way subordinate to the provincial authorities. (2) The board are empowerd: (a) to deal with and improve the navigation and harbor facilities of the port and its approaches; (b) to acquire land necessary for harbor purposes and also to acquire private harbor utilities, by agreement or by expropriation. If the method of expropriation be used, the price shall be submitted to arbitration (c); to construct all public harbor works and provide other public harbor facilities as needed; (d) to operate and administer public harbor works and utilities so provided. The board shall undertake watch and ward within the limits of all areas so occupied and used; (e) in co-operation with the maritime customs to frame harbor regulations, not affecting the proper authority of the customs; all these regulations to be enforced as heretofore by the maritime customs. The control of river police, of sanitary arrangements, of aids to navigation and of pilotage, remain as heretofore in the hands of the maritime customs; and (f) to receive and expend funds for the above purposes and to borrow money for the same. (3) The provision of the scheme for the administration of the Whangpoo conservancy, agreed to April 4, 1912, relating to the sale of crown lands, including the supplementary article agreed to January 19, 1916, shall remain in force and the privileges and powers then granted shall be transferred to the harbor board. Sub-section 9 to the above article shall be amplified as follows:

In the case of Chinese deeds purporting to include an area outside the high water line as it existed in 1906, the shengko area shall be reduced by such title deed area in cases where the title deed was issued prior to 1906. This deduction shall not, however, apply to any area under the general jurisdiction of any government or provincial department over such foreshores prior to 1906.

Duties.

24.—(1) It shall be the duty of the board: (a) to provide a navigable channel in the outer approaches and in the Whangpoo, of width and depth sufficient for the needs of the port; (b) to provide, increase and maintain harbor accommodation, utilities and improvements, as may be needed; (c) to operate and administrate all utilities and facilities provided; (d) to formulate from time to time projects with estimates of costs for works to be undertaken; (e) to maintain the existing and future works and improvements in effective condition; (f) to co-operate at their discretion in the improvement of private harbor facilities, charging reasonable rates for services rendered; (g) to receive and consider applications for permits for private works, and to supervise the execution of such works as may be authorized; (h) to prepare in advance a budget dealing with both capital and revenue for the forthcoming year; and (i) to publish a report annually of all operations of the board together with full statements of receipts and expenditures.

Finance.

25.—(1) The board shall have entire charge of the finance connected with harbor matters. In this connection: (a) they shall receive and take charge of all the funds, properties, assets and obligations of the Whangpoo conservancy board; (b) they shall receive all taxes, dues, grants and revenue from other sources, as specified under Clause 2; (c) they shall disburse the funds required for their administration and executive work at their discretion, taking all customary measures for the safeguarding of their funds, including the requirement of security by disbursing officials; (d) proper accounts shall be kept and audited at regular intervals; (e) in case of taking up loans the board shall inaugurate a sinking fund to redeem the loan in a period not exceeding 30 years in the case of works and 60 years in the case of lands. (2) The board shall be empowered to cause to be levied the following taxes at rates to be fixed annually, and advertised six months before they come into effect: (a) a conservancy tax of not exceeding ten per cent. of the gross customs duties and in the case of duty free goods not more than one-half of one per cent. *ad valorem*; (b) a transhipment tax on cargo directly transhipped to other ports, and not paying customs dues in Shanghai, of not more than one-fourth of one per cent. *ad valorem*; and (c) a tonnage due of not more than ten candareens per net registered ton of shipping using the harbor, imposed according to the present system of levying tonnage dues for general coast lighting and aids to navigation. (3) These taxes shall be collected by the Shanghai commissioner of customs and shall periodically on fixed dates be paid to the harbor board's account. (4) The board shall frame from time to time a scale of charges for the use of facilities provided, and for services rendered.

General.

26.—(1) The board shall, at their discretion, appoint, control and discharge the staff. (2) For all contracts in connection with the works and, under such regulations as the board may determine, for the purchase of material or machinery, for the leasing of public utilities and for the disposal of old plant and stores, etc., public tenders shall be invited and the tender offering the most advantageous conditions shall be accepted.

VII. Concluding Remarks.

27.—In conclusion the committee desire to point out that a well organized and experienced body already exists in Shanghai to form the nucleus of an efficient harbor administration.

The inauguration of a strong public harbor policy at the earliest possible moment is indeed a *sine qua non* for the prosperity of the port, will strengthen the position of Shanghai as the principal transhipment and distributing centre, and will confer immense benefits upon the shipping and commerce of China.

The position of the government is safeguarded throughout the committee's proposed scheme of development and administration, and no burden is placed upon the national exchequer.

A new board in absorbing the present conservancy board would succeed in ownership to works and assets of considerable value. The improvement and deepening which have been carried out and maintained with so much success, the dredging plant and appliances, the workshops and in fact all the belongings of the conservancy board, representing an outlay during the period 1906-1921 of fourteen million taels of which ten millions may be said to be capital expenditure, would become the absolute property of the Shanghai harbor board without any capital liability.

The committee wish to point out that the raising of capital and the general financial success of the scheme outlined above is absolutely dependent on the constitution of the new board being such that there are ample guarantees as to the policy and efficiency of that board's operations. They do not however feel sufficiently informed to detail the personnel for the board beyond saying that commercial interests must be adequately represented and have therefore thought it best to confine their report in this respect to the general recommendations they have made.

The committee most strongly urge the acceptance of their proposals as representing, in their opinion, the best, in fact the only, practicable means of developing the port.

W. M. Black; I. Hiroi; P. G. Hörnell; F. Palmer; L. Perrier; P. J. Ott de Vries; H. von Heidenstam (*Chairman*), *Members of the Committee of Consulting Engineers.*

Shanghai, 30th November, 1921.

Lower Liao River Conservancy

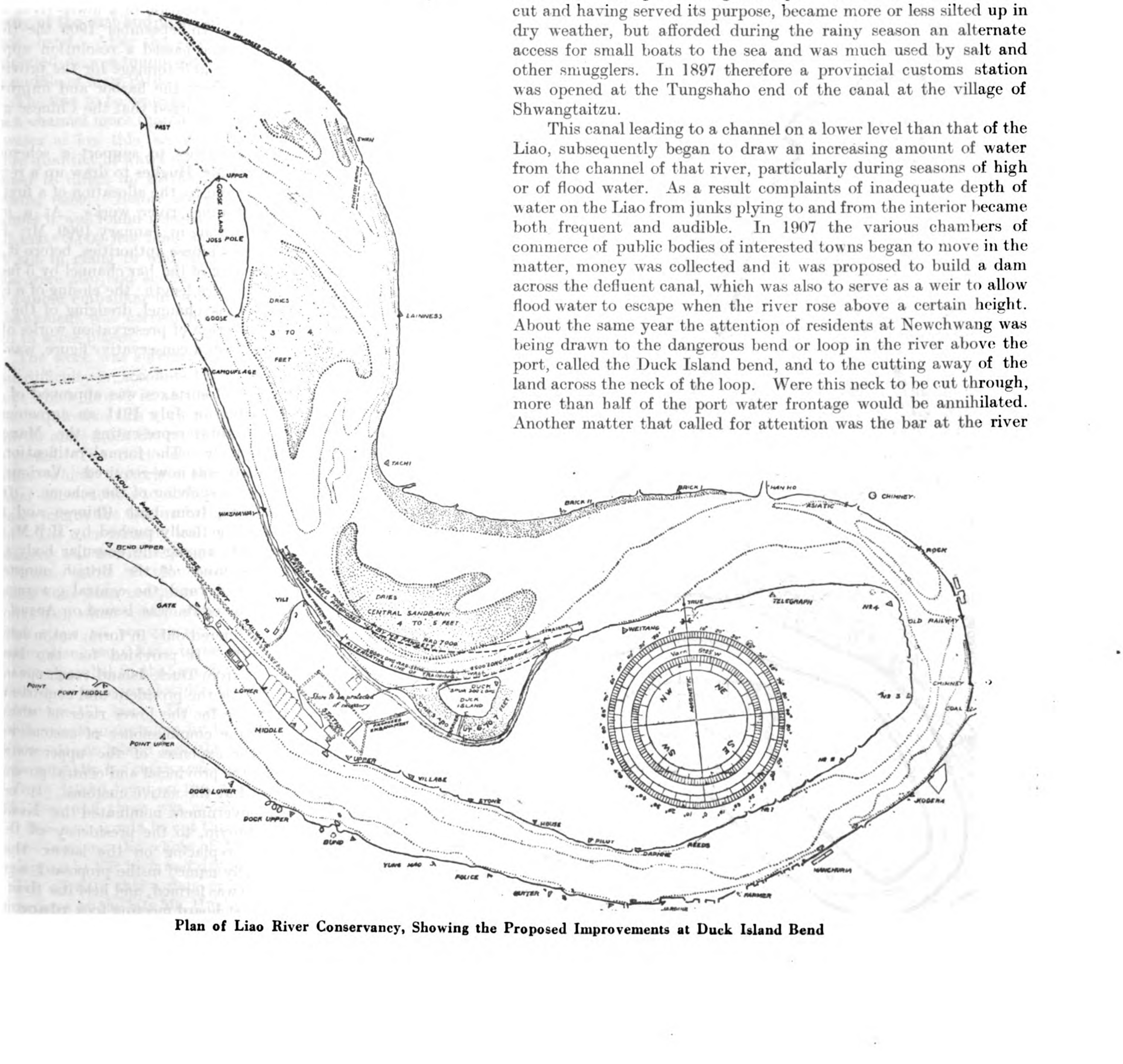
First Annual Report

THE River Liao, at the mouth of which is situated the port of Newchwang (Yingkow), rises in the Mongolian table lands several hundred miles to the north and west of the port. It forms the natural means of communication between the interior and the sea coast. Its principal inland mart and the head of the large class of junk traffic is Tungchiantzu, 30 miles north of Tiehling and some ·160 miles N.E. from Yingkow and 255 miles from Yingkow by River, situated just near the junction of the East and West Liao River (see Plan No. 6.) On this river thousands of junks (the number has been placed as high as 40,000) plied a busy trade. Like all alluvial rivers it was subject to change of course and to formation of sand banks. When the entrance to the river was surveyed by H.M.S. *Actaeon* in 1860 the port for sea-going junks was at Tienchwangtai some 30 miles from the sea, while the original sea port that gave its name (Newchwang) to the present town was some 23 miles further inland.

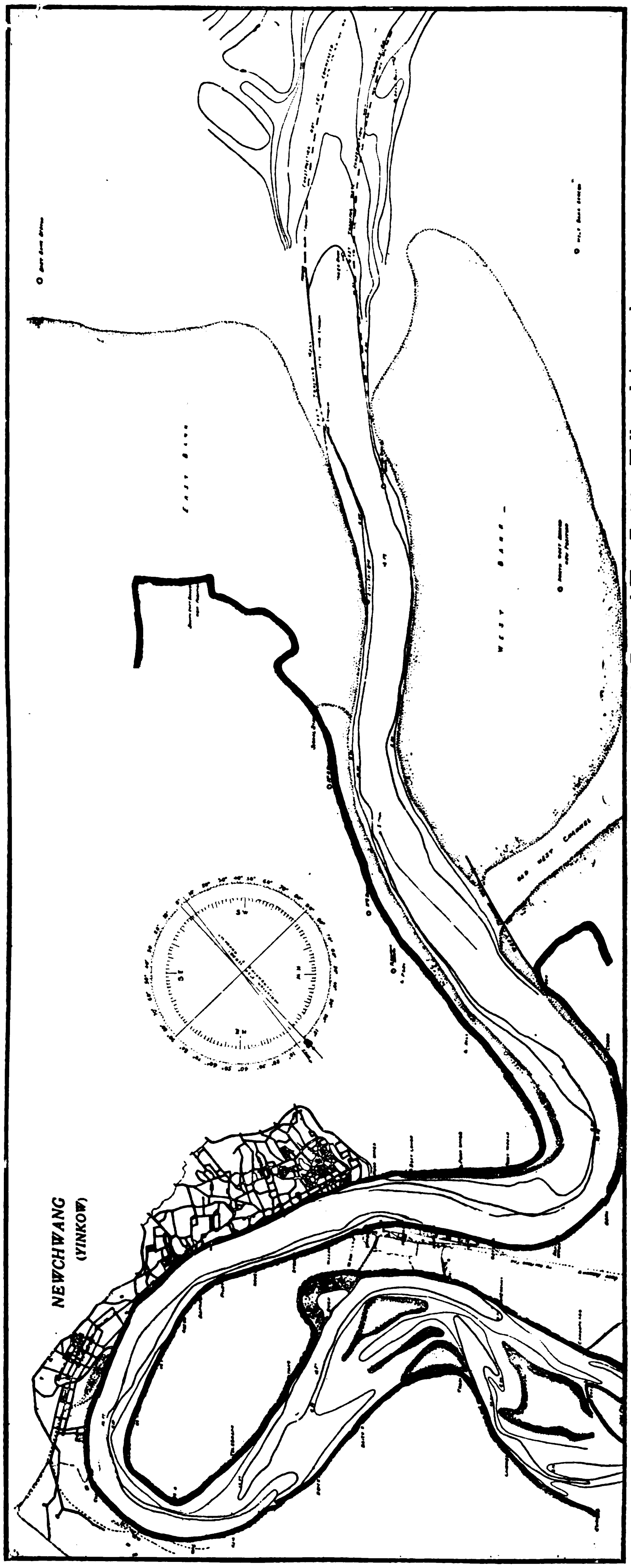
Up to 1889 the river may be said to have discharged its duties in a satisfactory manner. In that year, however, owing to a long continued and a very severe flood a channel of 33 miles in length was cut by villagers and salt smugglers at a spot called Tengchiawupu about 45 miles from the port, to allow of an escape of water westwards into the Tungshaho in order to afford relief to the neighboring country.

This cutting joined the Liao Ho with a tidal stream called the Palipu which at that time flowed as far as Shwangtaitzu being a tributary of the Tungshaho. All these are shown on Plan No. 6. The approximate length of the Shwangtaitzu cut being from Hanchaiwupu to Tengchiawupu. The channel having been cut and having served its purpose, became more or less silted up in dry weather, but afforded during the rainy season an alternate access for small boats to the sea and was much used by salt and other smugglers. In 1897 therefore a provincial customs station was opened at the Tungshaho end of the canal at the village of Shwangtaitzu.

This canal leading to a channel on a lower level than that of the Liao, subsequently began to draw an increasing amount of water from the channel of that river, particularly during seasons of high or of flood water. As a result complaints of inadequate depth of water on the Liao from junks plying to and from the interior became both frequent and audible. In 1907 the various chambers of commerce of public bodies of interested towns began to move in the matter, money was collected and it was proposed to build a dam across the defluent canal, which was also to serve as a weir to allow flood water to escape when the river rose above a certain height. About the same year the attention of residents at Newchwang was being drawn to the dangerous bend or loop in the river above the port, called the Duck Island bend, and to the cutting away of the land across the neck of the loop. Were this neck to be cut through, more than half of the port water frontage would be annihilated. Another matter that called for attention was the bar at the river



Plan of Liao River Conservancy, Showing the Proposed Improvements at Duck Island Bend



Lower Liao River Conservancy from Goose Island to the Sea, Showing the East and West Training Walls and Approaches

mouth which was increasing in length and reported to contain less water than was desirable. Agitation on these matters led to the survey of the bar and river by the marine department of the customs, and on the invitation of the provincial authorities a visit was paid to the spot by Mr. de Rijke, the government's engineer-in-charge of the Huangpu river conservancy at Shanghai.

The work of building a dam to regulate the flow of water from the Liao into the Shwangtaitzu canal was taken in hand in 1908 under the direction of the Manchurian government's engineer Mr. W. R. Hughes, M. Inst. C.E., London. Progress was made but slowly. Completion in 1910 was prevented by the high water of that year and by the immense volume of water passing down the new channel. In the following year just when dam and sluice gates were on the point of completion, the work was wrecked by the rising of the country people. Injury to vested interests and fear of floods were said to be causes of the rising; however this may be the fact remains that the general state of unrest due to the revolution combined with other causes led to the complete cessation of all further work. To such a pitch indeed had local feeling been wrought upon that it was more than a man's life was worth to visit the spot with a view to examine and re-commence operations.

While the work of the government on the upper river was in progress, the movement for the formation of a lower river conservancy board gathered strength. In September 1909 the (foreign) Newchwang chamber of commerce passed a resolution approving of the levy of a surtax on goods and tonnage for the provision of of funds to deepen the bar, protect the harbor and improve the upper course of the Liao. It also urged that the Chinese government should assist.

The readiness of the authorities to support a scheme was shown by their appointment of Mr. Hughes to draw up a report on the resolution of the chamber, and by the allocation of a first grant of two lacs of dollars towards upper river works. At a meeting of the consular body of Newchwang in January 1909, Mr. Hughes laid a copy of his report to the Chinese authorities, before it. The report provided for the deepening of the bar channel by 5 feet with a width of 2,000 feet over its entire length; the closing of a channel on the west known as the bar junk channel, dredging of the harbor in certain places, and the execution of preservation works at Duck Island bend. The estimated cost, a conservative figure, was placed at 600,000 dollars.

The scheme and the levy of surtaxes was approved of by the consular body, and eventually in July 1911 an agreement was signed by the Newchwang taotai representing the Manchurian government and the consular body. The formal ratification of the scheme by the diplomatic body was now required. Various delays due to several causes led to the shelving of the scheme. In 1913, however, local representations, from both Chinese and foreign merchants, supported and energetically pushed by H.B.M. Consul Mr. Hewlett, secured unanimity among the consular body and the new agreement with the assistance of the British minister was ratified by the diplomatic body and the central government in June 1914. A presidential mandate was issued on August 23.

The agreement of 1914 differed only in form, not in substance from that proposed in 1911. It provided for two boards—one for the upper river, *i.e.*, from Duck Island reach upwards, of which the Newchwang taotai is the president and controller under the governor of Fengtien; one for the lower river of which the taotai is the president and the commissioner of customs is vice-president and secretary. The expenses of the upper river conservancy will be defrayed by the provincial and central government, aided by the surtax collected at the native customs. In order to facilitate work the Peking government nominated the Newchwang taotai, now known as the taoyin, to the presidency of the upper and the lower river boards, replacing on the latter the superintendent of customs originally named in the proposed agreement.

The executive committee was formed, and held its first meeting in December 1914 and the first board meeting took place in March 1915. At this meeting the outline plans of the engineer-in-chief

were accepted and sanction was given to the proposal of the executive agreed to by the Manchurian government, that a dredger should be purchased by the boards of the upper and lower conservancy acting together, thereby greatly reducing working expenses. Active enquiries were made with a view to secure an efficient and reliable dredger.

A 7 per cent. loan for 6 lacs of dollars was concluded with the Hongkong and Shanghai Bank and the Russo-Asiatic Bank in equal shares from each Bank, and in 1919 a loan of Haikwan Tls. 400,000 was granted to the lower conservancy board by the inspector-general of customs. It may be of interest to add that the Shwangtaitzu canal has now become a large river entering the gulf about 30 miles west of Yingkow, and that the village of Shwangtaitzu, some 11 miles from the sea, is rising at a rapid rate to a mart of considerable importance. The distance of Tengchiawupu from the sea via Shwangtaitzu being approximately 45 miles as against 95 miles via Yingkow. It naturally follows that the water takes the most direct way to the sea via Shwangtaitzu with the consequent loss of fresh water to the Liao Ho.

The report and plans of the work that has been carried out and the progress that has been made follows: The works under the control of the lower conservancy board consist of the deepening of the bar by the construction of training banks and dredging, the closing of the east and west channels, and the protection of Duck Island bend. After the arrangement of the loan, etc., had been completed, it was found possible to commence work in earnest by the middle of May 1916.

The first to be undertaken was closing the west channel. This was a channel more than a mile in width, with from six to ten feet of water at low tide, some six miles below Newchwang. An immense quantity of water used to be diverted down it, which it was desired to direct on to the bar and so get full advantage of its scouring effect. Before access could be got to the shores of this channel it was found necessary to construct a causeway or path of reed mats 3,000 feet long so that men could safely walk over the soft silt in going to and from their work. Mats of willows and reeds were also laid across the channel to make a foundation for the rubble embankment which was then built upon them. The embankment was carried up to half-tide level, being sixteen feet high in some places.

The work was successfully accomplished, though not without some difficulty on account of the strong tidal current of about seven knots which flowed in and out before the barrier was built. The stone required in this work was procured from quarries on the coast some 30 miles from the mouth of the river, and transported thence by junks. The next work undertaken was the east channel closure which comprises the east training bank which was of similar construction to that across the west channel but of much greater length the closure being three miles long with its continuation. The east training wall, another two miles long, making in all a training wall five miles long and in places 22 feet deep to half-tide.

Three miles of this east training wall and east channel closure have been completed up to the end of this season's operation (1920), when work had to be discontinued owing to the frost which stops all construction work for five months. A similar training bank may have to be constructed on the opposite side of the river parallel to that on the east side, so as partly to constrict the river to its normal width and concentrate the full force of the current on the bar. The protection of Duck Island bend was another work undertaken by the conservancy. In the bye-course between Duck Island and the mainland, erosion had been going on very rapidly for many years past, till the distance across the neck of Duck Island bend on the mainland was reduced to less than 1,500 feet and there was considerable danger that in any great flood the neck would be cut through and the river thus change its course—causing the whole of the river front property of Newchwang to be left high and dry.

To obviate this a dam or embankment was made across the bye-course by the late Mr. Hughes, M. Inst. C.E., where it was 34 feet deep and 600 feet long. It can have been no easy matter to effect this, owing to the strong river current, but fascine mattresses of willows were made 45 feet long and 35 feet wide and sunk in place by loading with stone. Successive layers were superimposed one on the other till the surface of the water was finally reached. Besides the barrier or dam above mentioned, a low dyke was constructed along the river for six miles to prevent it overflowing at that place and so cutting across the neck of the bend. Before finally deciding on the use of training banks, as well as a limited amount of dredging, in December 1915 the opinion was obtained of the firm of consulting engineers, Sir John Wolfe Barry, Lyster and partners on the whole scheme for the improvement of the lower river. Again in 1920 a very complete set of the latest surveys of the bar and river together with current and tidal observations showing the effect that the training walls and works had already had upon the river and bar were forwarded to the consulting engineers, Sir John Wolfe Barry, Lyster and partners together with the report of the engineer; and their opinion again obtained. Their report verifies that of the engineer with the exception that the consulting engineers recommend a slightly different alignment for the proposed training wall at Duck Island bend. The works already carried out at Duck Island can only be of a temporary relief and some work must in future be done there or Newchwang may cease to exist. Since 1917 the construction of the east training wall has been continued, but two miles still remain to be completed. The proposed west training wall is not yet commenced.

Mountain of Sulphur in Pacific

ALMOST contemporaneously with the issue of the mandate of administration for the islands of Nauru and Ocean, famous for their extensive and rich deposits of phosphate of lime was the rediscovery of the great sulphur mountain of Vanua Lava in the Banks group of the New Hebrides. The special agents necessary to change phosphate rock to a soluble state is sulphur. Superphosphate is the powdered and soluble article sold to farmers as a fertilizer.

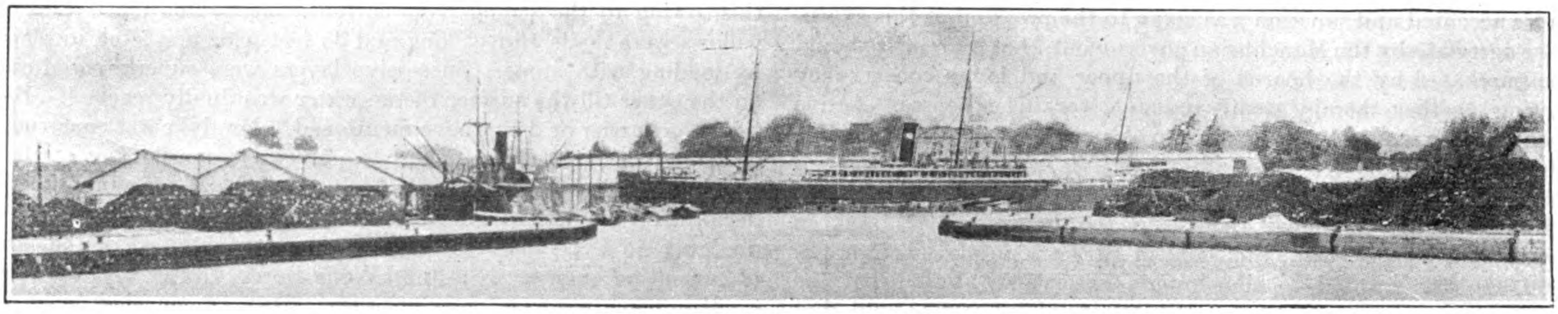
The mountain of Vanua Lava is one vast mass of sulphur, the quantity being 99 per cent sulphur and the balance ash. The height of the mountain, which forms an island in itself, is 1,600 feet, the area of the island being about 100 square miles.

Vanua Lava, as part of the Banks group, is included in the administration of the Condominium government of the New Hebrides. The Banks group lies between the fifteenth and the twentieth degrees of south latitude and is about 900 miles from the Queensland coast.

Condominium Difficulties

Twenty-five years ago a French company began operations on the mountain, employing competent engineers. The company built a long, substantial, coral-concrete wharf and a storehouse in a small bay at the foot of the mountain and constructed an aerial railway up the mountainside for nearly 900 feet. Hundreds of natives were employed in digging out the sulphur and hundreds more in carrying 50-pound bags of sulphur to the railway terminus whence carriers where sent rapidly to the storehouse on the bay The first shipment of sulphur sent to France paid handsomely, but the company suddenly left the field, giving as a reason that malarial fever of a malignant type made it impossible for white men to live on the mountain island.

It was eventually stated, however, that the company had learned that the administration of the New Hebrides was not in a position to guarantee the company a monopoly, a prior right from an Australian engineer, the original discoverer of the commercial possibilities of the island, being in existence. To-day this claim holds good, but Condominium law prevents any prompt commercial activities on the island. A British-Australian company is now endeavoring to begin operations, and has opened up negotiations with the Condominium government.



Entrance to the New Wet Dock

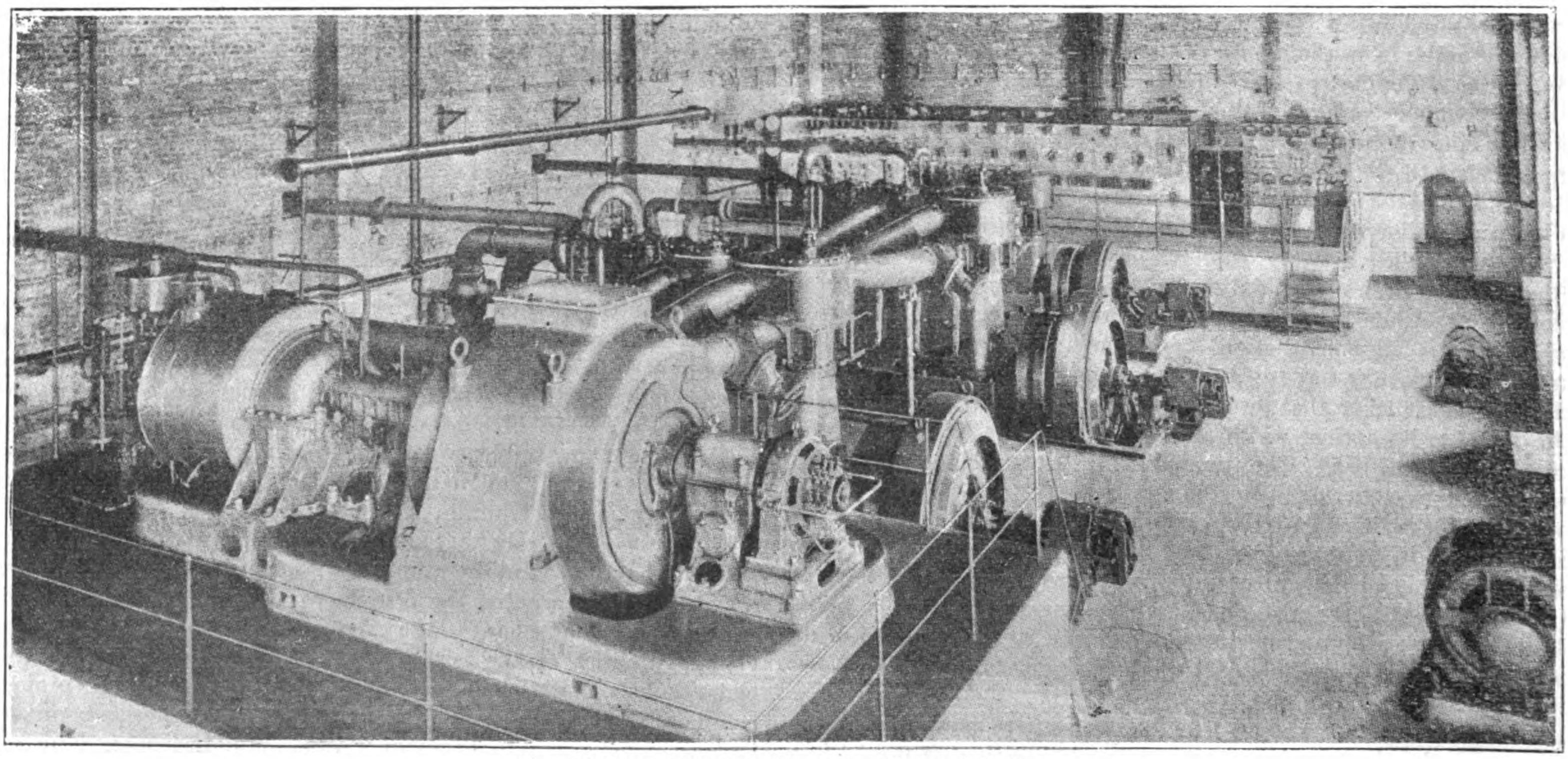
The Singapore Harbor Works

WITH Germany vanquished and India released from the menace of an attack from the west, Singapore becomes the Gateway of Empire, the Gibraltar of the East, the logical headquarters of the British Fleet in the Pacific, the stopping place of all the great lines of passenger and cargo carriers that ply between Europe and Eastern Asia. It is a great harbor with a great history, rivalling Hongkong in its growth, importance and in the magnitude of its improvements. The report and accounts of the Singapore harbor board for the year ending June 30, 1921, just to hand, conveys some idea of the advances made in the traffic and revenues of the port. The gross revenue was $17,493,295; the total tonnage of vessels using the wharves was 5,242,356, about 400,000 tons increase over the preceding year, but less by more than a million tons that of the year 1912, the high water mark of the board in tonnage. The tonnage of cargo handled showed a slight increase over the previous year, but again much less than in 1912.

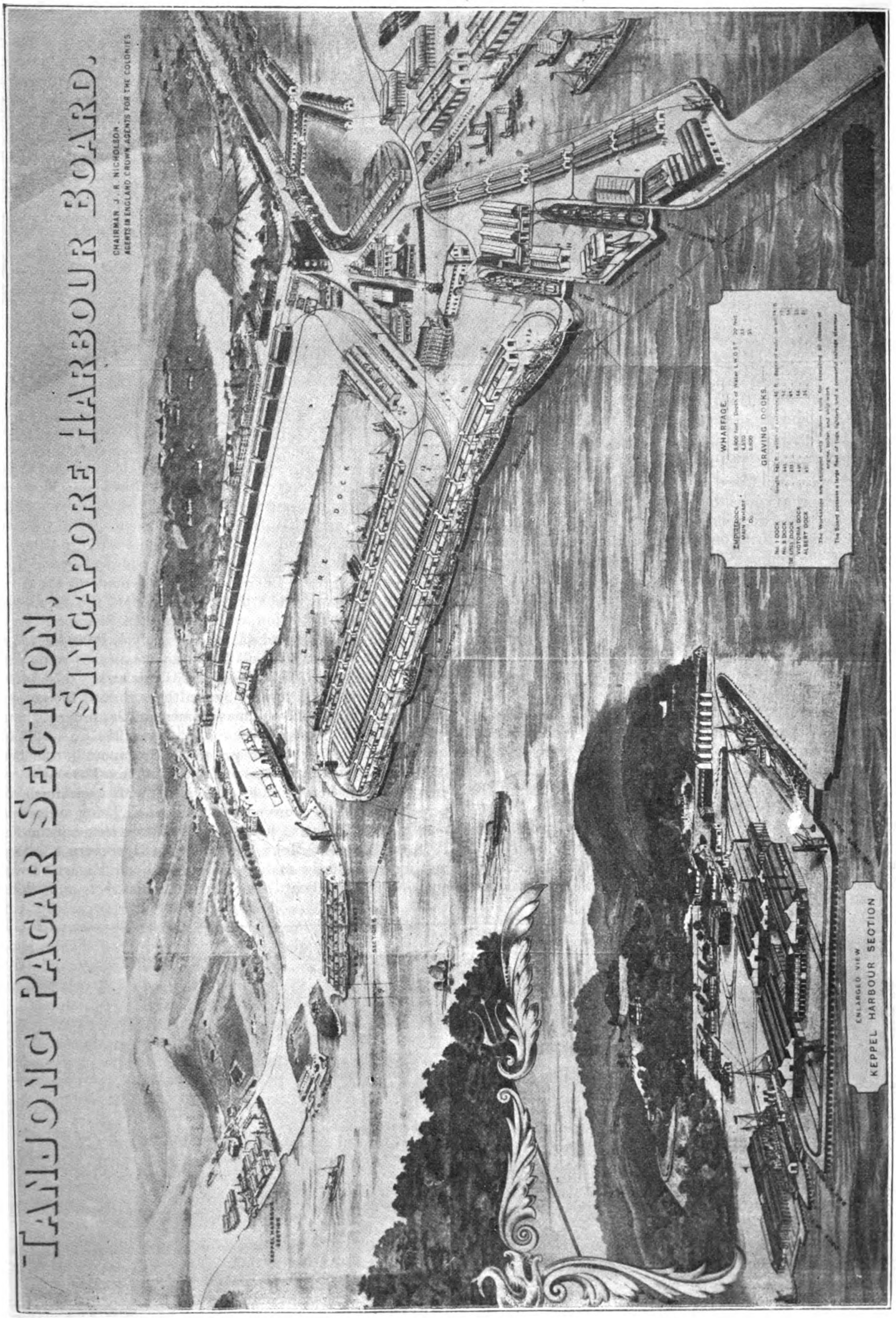
The history of the harbor is the history of Singapore and instead of attempting to give our readers an idea of this great work from the dry statistics of the reports and publications of the harbor authorities, we reproduce extracts from a most excellent and up-to-date description that appeared some time ago in our contemporary, *The London and China Express*, from the pen of Mr. J. R. Nicholson, C.M.G.

As was pointed out in Mr. Nicholson's article, its steady development has been largely due to the enterprise of the Tanjong Pagar Dock Co., formed in 1863. The first proposition was for the construction of a graving dock 550-ft. long with 65-ft. of width of entrance and with 23-ft. of water on the sill. An engineer was engaged in England, who arrived in Singapore in September, 1865, and work actively proceeded on a dock 450-ft. long, which was opened in October, 1868, as the Victoria Dock. The capital of the company was $300,000, the heavy outlay necessary for the completion of the dock being obtained by the issue of 10 per cent. debentures. In 1870 the company leased, in conjunction with the Patent Slip and Dock Co., the Bon Accord Dock. In 1876 the construction of another dock was commenced under Mr. Jackson as engineer, and opened as the Albert Dock in 1879. This dock is 496-ft. long, with 59-ft. width of entrance and with 21-ft. of water on the sill. In the early eighties the directors were much exercised in their minds as to how to deal with the growing tonnage. A railway connection between Tanjong Pagar and the town was proposed in 1866, but fell through. In 1872 a 4-ft. 8½-in. gauge line was laid behind the wharves, worked by horses, but was abandoned. Another large graving dock was proposed in 1885, but the scheme did not meet with success.

In 1885 a large addition was made to the property and wharfage by the purchase of the Borneo Company's property adjoining



Electric Power Station, Singapore Harbor Works

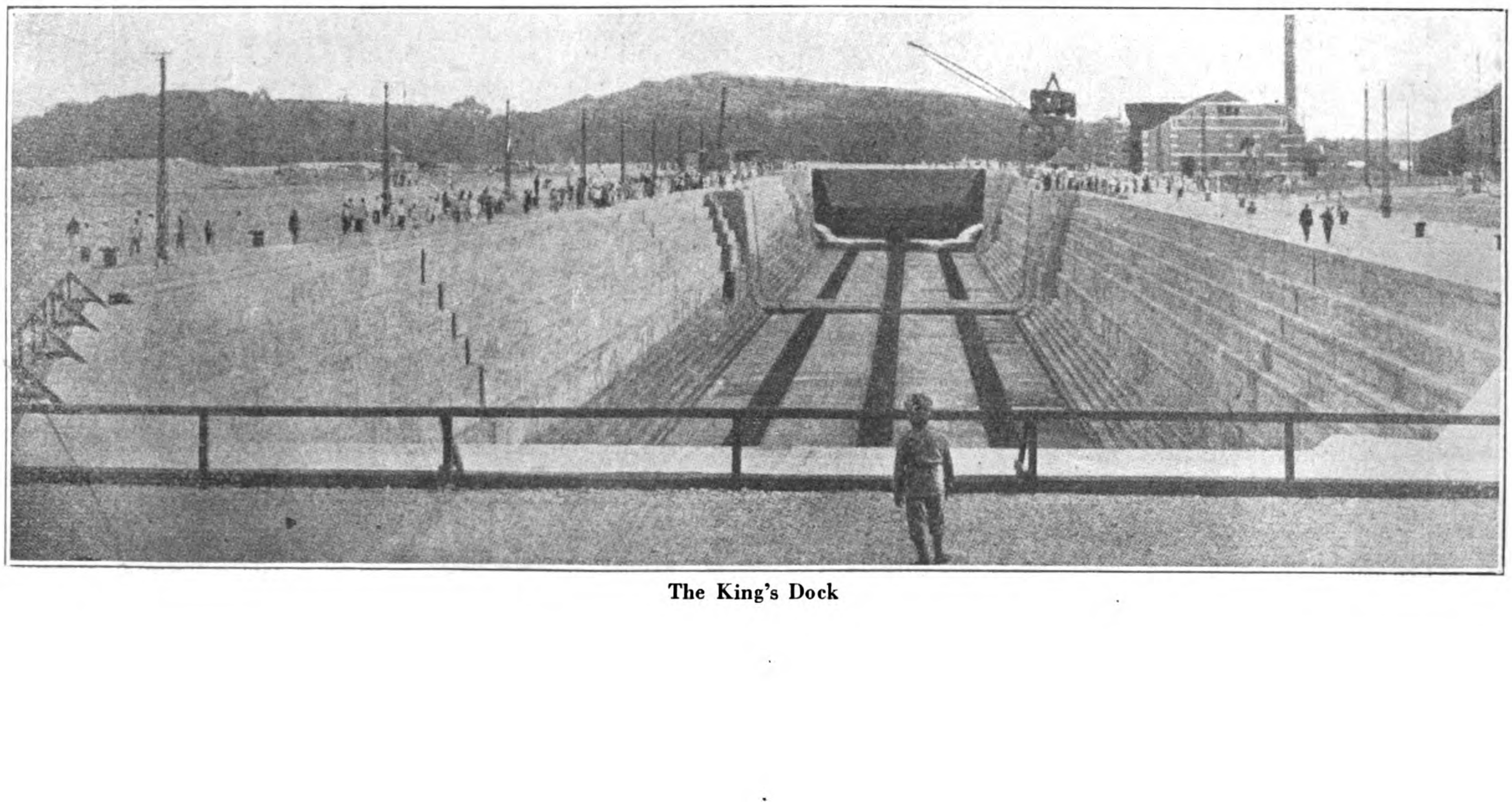

TANJONG PAGAR SECTION,
SINGAPORE HARBOUR BOARD.
CHAIRMAN J. R. NICHOLSON
AGENTS IN ENGLAND CROWN AGENTS FOR THE COLONIES
ENLARGED VIEW
KEPPEL HARBOUR SECTION

Present Method of Transporting Cargo from the Wharves to Town

that of the company's. In 1889 the company extended its operations to Penang by leasing, in conjunction with the New Harbor Dock Co., the Prye Dock. The Singapore Tramway Co.'s lines and rolling stock were purchased in 1889, mainly with the object of facilitating transport of goods to town, but as the business proved unremunerative the lines were closed in 1894. In 1899 the company's capital was raised to $3,000,000, a sum more in accordance with the value of the company's assets than its original capital. In the same year the company purchased the New Harbor Dock Co.'s undertaking, the Prye Dock at Penang being also taken into the fold. The directors since 1874 consistently bought up land adjoining their own property, a policy which afterwards not only proved of benefit to the company, but allowed for the carrying out of the new extension works of the government at much less cost and freedom of design than otherwise would have been the case.

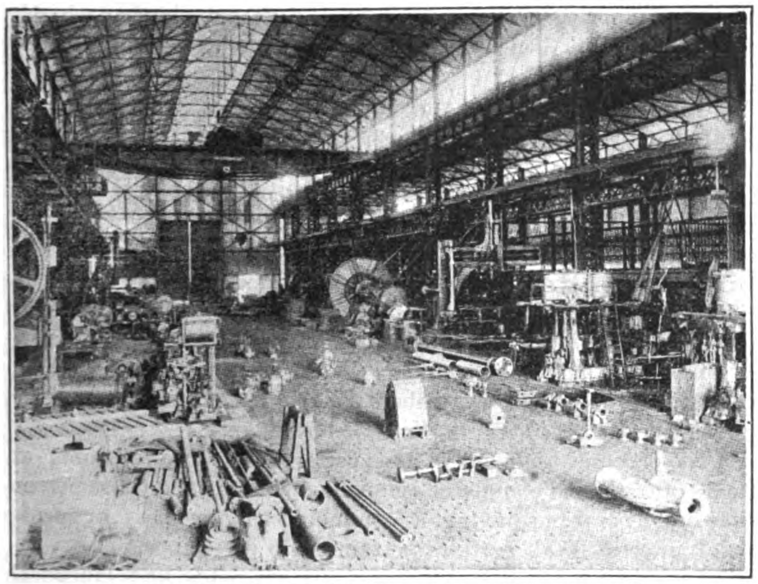
During the 'nineties it became very evident that the shipping facilities provided at Tanjong Pagar were totally inadequate to meet the growing requirements. Various schemes were evolved to remedy matters. Proposals to extend the wharfage to the east alternated with the idea of dredging to allow wharves behind the existing wharves. A dredger was contracted for to carry out the latter idea, but on its delivery it was put to work on the eastern scheme dealing with a material for which it had not been built and was unfitted for. In 1904 a scheme for the reconstruction of the wooden wharves in permanent material and the construction of a wet dock was approved by the directors, but as this scheme involved the expenditure of a sum three times that of the company's capital, differences arose as to how the money was to be raised. The difficulty was solved by the colonial office deciding to expropriate the company's property on behalf of the Straits Settlements government, and that failing a settlement as to the value the question to be decided by arbitration. An ordinance to give effect to this decision was passed by the legislative council in Singapore on April 7, 1905. An offer was made by the government of $240 per share, which not being accepted the value was determined by an arbitration court sitting in Singapore in October, 1905. The court's award was given on July 4, 1906, for $28,453,554, an amount which, after all liquidation expenses were paid, gave each shareholder $761.76 per share. This award raised the capital liabilities of the new owners by ten times that of the old company.

From July, 1905, the management of the property was vested in the Tanjong Pagar dock board. In 1912 an ordinance was passed constituting the board as the Singapore harbor board and definitely defining its duties and jurisdiction. This same ordinance created the "Penang harbor board," with very much the same powers as the Singapore board, both boards being under one chairman as the executive head. A contract was made in February, 1908, with Messrs. John Aird & Co. to construct a wet dock and reconstruct the main wharf at Tanjong Pagar. Towards the end of 1909 the board cancelled their contract, and, taking over



The King's Dock

their plant, continued the work, until a new contract was entered into with Messrs. Topham, Jones and Railton to complete the work, which they successfully carried out, the first vessel to enter the dock being the s.s. *Valdura*, on June 2, 1914. The wharf reconstruction was finished on May 24, 1917. This—the Empire Dock—covers an area of 24½ acres, with a depth of water at low water ordinary spring tides of 30 feet. The quayage at this depth being 3,522 feet in length, the dock is so designed that it can be increased to 35 acres in area, with 5,734 feet of deep-water quayage, and the depth to 33 feet. The width of the entrance is 150 feet.



Keppel Harbor Works—Machine Shops, Large Tool Bay

The dock walls are of solid concrete. The width of the quays is 35 feet. The material removed in the excavation of the dock was sufficient to reclaim over 150 acres of swamp land, which will prove a valuable asset in the future. The old timber wharves westward of the Victoria Dock have been demolished and replaced by two wharves—"Main Wharf," 3,152 feet long from the Victoria Dock entrance to the entrance of the Empire Dock, and the "West Wharf," 1,260 feet long from the Empire Dock entrance to "Jardine Wharf." These two wharves are built of solid concrete block walls to above low-water mark, and to quay level in solid concrete. There are two short sections of these wharves of different construction owing to the great depth at which a solid foundation was found, one section being of iron cylinders filled with concrete supporting a troughed steel decking overlaid with granolithic concrete, the other being of ferro-concrete construction. The quays are 45 feet wide, giving ample space for the handling of cargo, railways, etc. All quays slope at an incline of 1 in 60 back from the coping through the godowns to the loading platforms. This slope brings the loading platform on the same level as the floor of railway trucks and carts. The standard godowns are 200 feet long by 100 feet wide, well ventilated and with an overhanging roof on both sides, that on the wharf side giving cover to rough cargo, and on the other side affording cover for loading or discharging trucks. The cost of the works comprised in the wet docks and wharf reconstruction amounted to $18,886,225.

On January 1, 1909, another contract was made with Messrs. Topham, Jones and Railton for the construction of a large graving dock, completed and opened as the "King's Dock" on August 26, 1913. This dock, the largest in the East, is 879 feet long, and by placing the caisson in the outer step the length is increased to 895 feet, the entrance being 100 feet wide, depth of water on the sill 34 feet. It is divided into two by a caisson, so that, if necessary, a vessel of 500 feet long requiring a length of time in the dock can be placed in the inner portion, leaving the outer portion for use of vessels up to 346 feet in length. The outer and inner caissons are interchangeable. These caissons weigh 826 tons each.

Prior to its construction the greater part of the area was covered by water at high tide, so that the first operation was to dry the site. A watertight embankment was run out from the shore. In continuation of this bank, a cofferdam was driven enclosing the seaward end of the dock and joining in with the existing reclamation to the westward. The area enclosed was cleared of water and excavation commenced. The material derived from the excavations was used for filling up and raising the general area of the ground around the dock. The emptying culvert for the inner dock is carried through the body of the west wall, and thence to the pumping station installed a short distance inside the outer entrance and adjoining the west wall of the dock. The corresponding culvert for the outer dock is carried directly across from that dock, and filling culverts are provided in each wall at both the inner and outer entrance.

The dock is constructed of concrete, with Cornish granite ashlar entrances. Three rows of keel blocks are provided. The pumping plant consists of two sets of compound engines driving two 60-inch pumps, supplied by Messrs. J. and H. Gwynne & Co., of London. This plant is capable of emptying the dock of its 22,000,000 gallons in less than two hours, approximately at the rate of 820 tons per minute. The main pumps consisted of two "Invincible" centrifugal pumps, having double suction pipes 42-in. diameter, and single discharge pipes, 60-in. diameter, driven by vertical direct-acting compound engines, working at 150-lb. pressure. It was required of the pumps that they should together be capable of emptying the dock in three hours. As a matter of fact, at the time of the trials, this was accomplished, as we have mentioned, in less than two hours. Each pump is provided on the discharge side with a sluice valve actuated by an electric motor, these sluices being in addition to the non-return valves already referred to. For drainage purposes, two 12-in. centrifugal pumps are used, each being capable of delivering 2,500 gallons per minute against a head of 50-ft. of water. These pumps are driven by electric motors. The capacity of the dock at high water is about 3,570,000 cub. ft., the total lift from the dock bottom at high water being about 39-ft. to 54-ft. The foundations of the engine-house consist of Portland cement concrete carried well down into the shale. The two emptying culverts, to which reference has already been made, are led into a main sump running the whole length of the engine house, and formed in the concrete base. The centre of the engine-house is in the form of a deep well, in which the pumps are placed, the pump suctions being carried down through the concrete into the main sump. As a necessary precautionary measure an asphalte damp-course is provided below the floor of the engine-house, and continued up the back of the walls, so as to prevent the moisture percolating into the well, for it will be noticed that the floor of the well is considerably below the level of low water. The face of the well is lined with white glazed brick, for cleanliness, and also to give light.

The discharges from the pumps are formed of cast-iron segments, built into the concrete. They lead from the pumps into a chamber situated immediately outside the engine-house, the discharge outlets into this chamber being provided with non-return valves. A large culvert is laid from the further side of this chamber, which finally discharges into the harbor outside the outer entrance through the western-wing wall. Between the two main pumps are a pair of drainage pumps with suction and discharge pipes.

Immediately adjoining the engine-house is the boiler-house. In order to save expense in foundations, this building is carried throughout upon bearing piles driven down to the shale. Three Babcock and Wilcox water-tube boilers have been provided, and space is left in the boiler-house for another set if this should be required hereafter. The working boiler pressure is 160-lb. Superheaters and an oil eliminator are also provided. In connection with the boilers, an induced-draught plant has been introduced. As previously mentioned, two caissons have been provided. They consist of steel plating supported by angle-steel frames, these being stiffened and strutted as required, and the top surface of each

caisson is decked over to form a roadway, being also provided with rails for railway traffic. A 15-ton traveling electric crane serves one side of the dock, and a 5-ton the other. The dock is well provided with capstans of 10 and 5 tons capacity, electrically driven, as are the motors operating the penstocks. The cost of this dock and equipment amounted to $3,697,000.

In close proximity to this dock are two others, formerly the property of the New Harbor Dock Company. One was reconstructed in 1907, being 380-ft. long, 45-ft. width of entrance, with 14-ft. of water on the sill; the other being 463-ft. long, with 64-ft. width of entrance, and 17-ft. of water on the sill. The workshops attached to these docks have been entirely reconstructed, and are fitted with suitable machinery for dealing with the heaviest repairs to large vessels. All machines are electrically driven, as is all machinery throughout the property, with the exception of the large pumps of the "King's Dock." The electric power station contains a turbo-generator of 1,200 kw. capacity, also three high-speed triple-expansion sets, two of 400 kw. each and one of 200 kw. Superheated steam is supplied by three high-capacity Babcock and Wilcox water-tube boilers. Mechanical-induced draught can be used in the case of any sudden demand of increased power being called for.

The whole extension and reconstruction scheme has been laid out with a view of expansion as the demands of the future may require, there being ample room and strength to carry larger godowns and the erection of any mechanical device for labor-saving. The present godown floor area at Tanjong Pagar being nearly 20 acres, there is storage space available for 200,000 tons of coal. Eleven miles of railways and 13 miles of roadways connect the various sections. The main roads are 75-ft. wide, and the railways connect with the Malay States railway system, so that it is now possible to send loaded trucks from the ship's side at Tanjong Pagar direct to Bangkok. Designs have been prepared for a coaling wharf 1,200-ft. long, to be fitted with mechanical appliances for dealing with coal cargoes and bunkering, but owing to the exigencies of the war its construction has been postponed.

In 1907 a contract was let by the government to Sir John Jackson, Ltd., for the construction of wharves, with a protecting breakwater 5,650-ft. long, at Teluk Ayer. The original contract was for a continuous line of wharf 4,990-ft. long, but during construction the design was altered to allow of a boat harbor behind this wharf. This contract has been completed, with two wharves 1,570-ft. and 2,500-ft. respectively in length, with an opening between to the boat harbor, the depth of water alongside these wharves to be 18-ft. at low water spring tides on the sea side, and 7-ft. in the boat harbor. The completion of the boat harbor has been postponed on account of the difficulty in dredging work due to war contingencies. This harbor will be 18 acres in area, the sides to be finished in steps so as to facilitate the loading and unloading of lighters at any state of the tide. Seventy acres of land have been reclaimed by these works, and it is regrettable that the necessity of postponing the dredging has prevented the building of godowns on this area (which are so much required) owing to the danger from settlements which will inevitably occur on some parts of it during the operations. When completed this scheme will afford a great relief to the river traffic, much congested at present, but which cannot be relieved except at a cost of works to prevent silting out of all proportion to the results achieved.

Aircraft Chamber of Commerce

ORGANIZATION of the aircraft industry into a national body known as the Aeronautical Chamber of Commerce of America, with approximately 100 charter or founder members embracing the designing, constructing, operating and kindred elements and representing virtually every section of the United States has been been brought about through the initiation of the Manufacturers Aircraft Association. Among other things, it will develop the market and increase the use of flying machines among civilians, corporations and transportation companies.

The aircraft industry thus follows the example of all other modern industries which owe their resent greatness in no small measure to the trade association. Organization of the Aeronautical Chamber of Commerce, following as it does the creation of the Bureau of Aeronautics in the Navy Department, and provision, in the Wadsworth-Hicks Bill for a Commissioner of Civil Aviation in the Department of Commerce, and the nationalization and extension of the Aero Club of America, completes the accomplishments for the year and establishes the machinery whereby, it is believed, the development of American aviation will be greatly hastened.

The Aeronautical Chamber of Commerce of America is incorporated under the laws of the State of New York. Among its aims and purposes, as set forth in the Charter, are:

To foster, advance, promulgate, and promote trade and commerce, throughout the United States, its territories, possessions, and in foreign countries, in the interests of those persons, firms or corporations engaged in the business of manufacturing, buying, selling and dealing in aircraft, aircraft motors, and aircraft parts and accessories of every kind and nature.

To diffuse among its members accurate and reliable information as to the standing of its members and those persons, firms or corporations engaged in similar lines of business.

To procure uniformity and certainty in the customs and usages of trade and commerce among its members and those persons, firms or corporations having a common trade, business or professional interest in all matters pertaining to aeronautics.

To aid and assist in mapping out air roads and lanes; the location of landing fields, airdromes, hangars, or such other structures as may be necessary for the advancement of aeronautics.

To advocate and promote in every lawful way the enactment of just and equitable laws pertaining to aeronautics.

To settle, adjust and arbitrate any and all differences which may arise between its members, and persons, firms or corporations dealing with them.

To promote a more enlarged and friendly intercourse between its members and persons, firms and corporations engaged in the business of, or dealing in aircraft, aircraft motors and aircraft parts and accessories, and generally to do every act and thing which may be necessary and proper for the advancement of the aeronautical art and industry and the accomplishment of the objects and purposes hereinbefore set forth; provided, however, that nothing herein contained shall authorize this corporation to engage in any business for pecuniary profit.

The need for a central trade organization, including within its membership all of the responsible and permanent financial and professional interests in aviation in the country, has been felt for some time.

"The existence of the Manufacturers Aircraft Association partly met the need. Its work has been characterized by a broad public-spirited attitude toward the entire industry and has been effective, but its members were the first to realize that an organization limited simply to manufacturers of airplanes, having, primarily, a common interest in the exchange of licenses for the use of patents, could not hope adequately to give representation to the entire field.

"The new organization has taken over the offices and equipment of the Manufacturers Aircraft Association at 501 Fifth Avenue, New York City. The latter organization will continue to serve its members in handling the administration of the cross license agreement covering airplane patents. The Aeronautical Chamber of Commerce will assume and greatly extend all of the functions formerly handled by the older organization, including the collection and dissemination of information regarding aeronautical activities in this and other countries; the publication of the Aircraft Year Book; and the furnishing of special services to its members through its various departments and committees.

Rangoon Port Improvements

RANGOON, which is now the principal port in Burma, became a regularly established port in 1853. For many years afterwards a government flotilla was kept up for the conveyance of troops and government stores only on the Irrawaddy River, together with a dockyard and workshops in Rangoon for repairing the steamers and flats, etc. Both flotilla and buildings were taken over in 1864 by the Irrawaddy Flotilla Company, established in Glasgow, which has now a very large fleet of river craft.

Rangoon became the seat of local government in 1862. It had made but moderate progress as a port during the preceding ten years of British occupation. A lightship had been placed at the mouth of the river (in June, 1852), and a wooden wharf had been built in the port itself (in 1859). The earliest statistics readily available are for the official year 1861-62. In that year the receipts of the Rangoon port fund, including Rs. 5,174 wharfage, aggregated Rs. 60,072, "showing an increase of nearly 100 per cent. over the previous year"; and the expenditure amounted to Rs. 44,940, most of which was on account of establishments, stores and repairs to the light-vessel and boats. The number of vessels which entered the port in 1861-62 was 438, with a tonnage of 157,472, equal to 340 tons per vessel. The bulk of the trade at this time was coastwise, but few vessels entering the port direct from foreign countries; and most of the goods were landed on the bank of the river from cargo-boats. The value of the imports in the year above mentioned was Rs. 1,23,87,679, and of the exports Rs. 1,40,26,752, a total of Rs. 2,64,14,431.

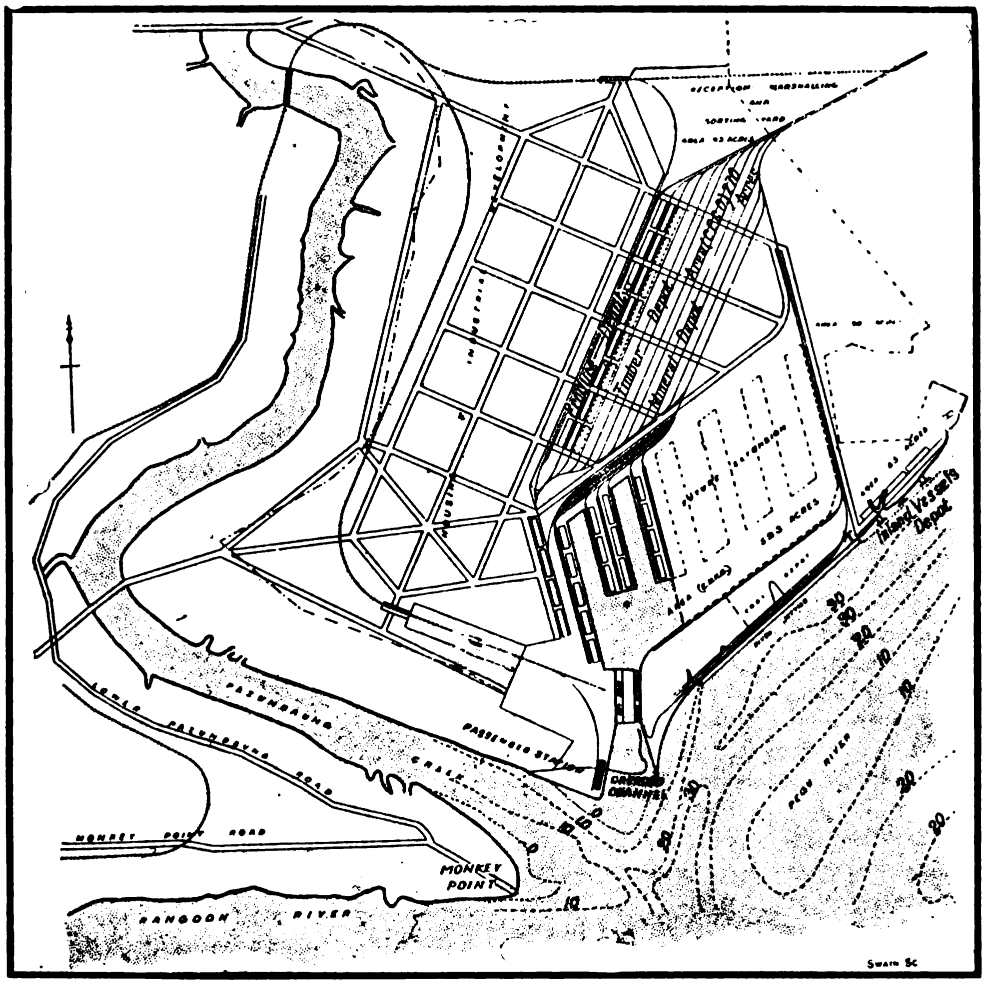


Fig 1. Plan of Proposed New Dock at Rangoon

The wharves and jetties were situated in the foreshore known as the Strand bank, which was supervised by the magistrate up to July, 1874, when it was placed in charge of the president of the Municipality. Almost all the revenue derived from it for about twenty-three years had been appropriated for the benefit of the town, a very small proportion having been expended on port improvement. In June, 1876, the management of the Strand bank, which was reserved from municipal limits under a special notification at the date of the inauguration of the municipality, was handed over to a committee consisting of the master-attendant, collector of customs and the executive engineer, and all the revenue collected was expended in providing accommodation for boats and in improving the foreshore generally. In June, 1878, the governor-general in council approved the proposal to create a trust, and a corporate body known as the commissioners for the port of Rangoon was formed with effect from January 1st, 1880.

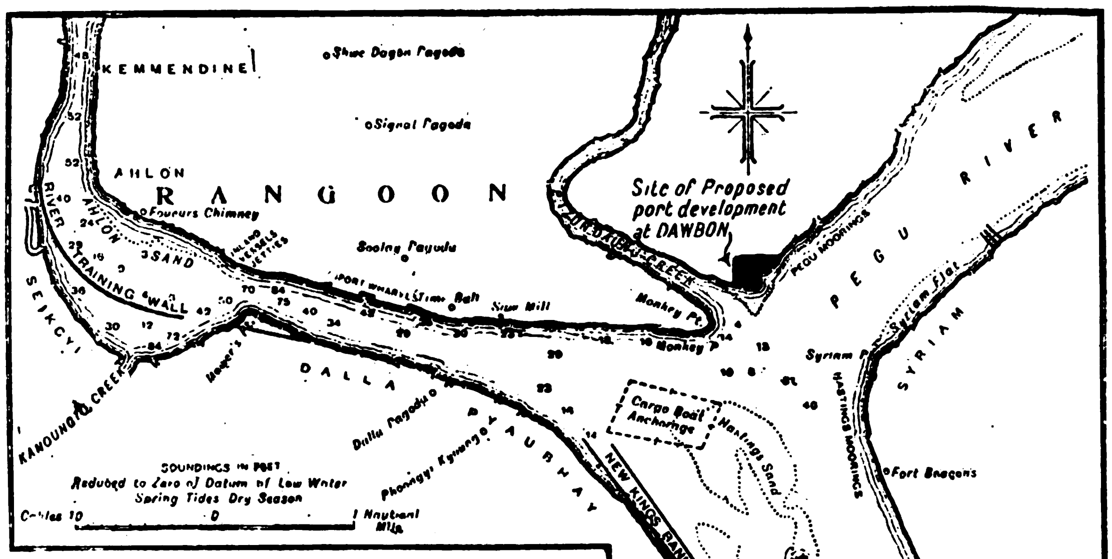
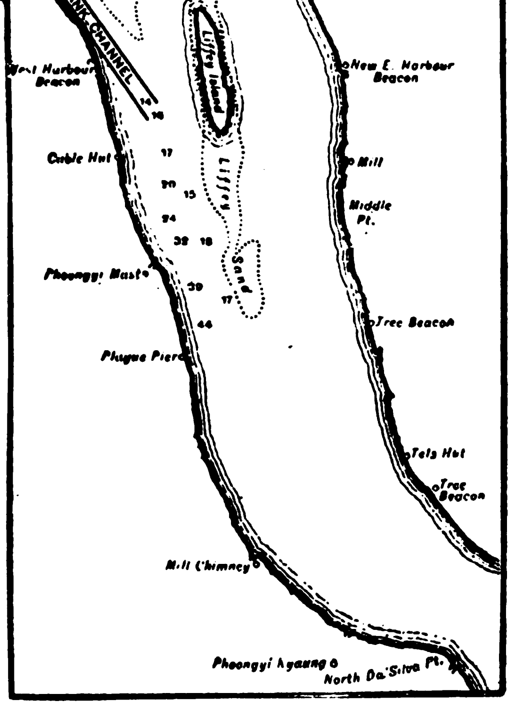
When the commissioners took charge there were three fixed jetties and one pontoon jetty for the accommodation of sea-going steamers, there small fixed jetties for boat traffic, and two small jetties for passengers. For the inland traffic the Irrawaddy Flotilla Company had three small pontoon jetties, but there was no public jetty accommodation available. There were no moorings in the port. In 1880-81 the number of vessels entering the port was 874, of which 478 were steamers, 199 European sailing vessels, and 197 native craft with a total net tonnage of 598,303. In 1920-21 the number of vessels entering the port was 1,303 steamers and 398 native sailing vessels, with a total net tonnage of 2,300,513.

Statistics of the tonnage of goods landed and shipped in 1880-81 are not available, but the value of the trade of the port was Rs. 10,38,68,938. In 1920-21 the sea-borne trade aggregated 4,037,923 tons, while the value was Rs. 87,95,43,447. The export trade alone totaled nearly three million tons, whilst imports exceeded one million tons. In addition, there was continually expanding inland water-borne traffic, of which the Irrawaddy Flotilla Company has the greatest share, with its volume in 1920-21 of some 765,000 tons.

Mention has not hitherto been made of the immigrant traffic of the port of Rangoon to and from India. This is of a seasonal character, Burma being largely dependent on Indian immigrants for the bulk of her labor supply. The number of immigrant passengers through Rangoon exceeds 250,000 in each direction yearly, and complaints of poor treatment and of delays on arrival owing to medical and other inspections have been a subject of agitation for many years. Much of the trouble has been admittedly due to the inadequate landing arrangements provided in the port, and there is no doubt that the conditions for third-class passengers have been distinctly unfavorable.

The administration of the port is vested, under the Rangoon port act, in a representative public body, the commissioners for the port of Rangoon, which has as its present chairman Mr. J. A.

Cherry, C.I.E., M.L.C., barrister-at-law, who was appointed to that position in December, 1920. In its early days, the Rangoon port commission was administered by a vice-chairman; in 1901, Mr. (now Sir) George C. Buchanan, a civil engineer, became its head, combining the offices of chairman and chief engineer, and this was continued when, in 1915, Sir George Buchanan left for Mesopotamia, until Mr. Holmes retired in 1920. Mr. Cherry's appointment, as a man with business and port experience, marked the separation of the two offices of chairman and chief engineer. The business needs of the port have grown to such an extent that they demand attention separate from the engineering problems with which every port authority has to cope.

Rangoon and Proposed New Dock Site

Certain existing wharves and extensive foreshore properties were vested in the commissioners on their incorporation in 1880, and from time to time other properties have been acquired since. The foreshore on the harbor extends over 7,200 yards, of which approximately two-thirds is occupied by the commissioners, and developed for port traffic purposes. The whole is very inadequately served by the single line of the Burma Railways suburban branch, and improvement is impossible as the crowded city impinges upon the foreshore along its whole length, The commissioners' wharves, jetties and pontoons are becoming inadequate for the port's traffic, and improved and increased facilities for foreign, inland and passenger traffic are imperative. The port of Rangoon consists of the harbor proper, or what may be described as the inner harbor, where the Rangoon River is some 800 yards wide, and where are provided fourteen swinging and eight fixed double moorings for sea-going craft. To reach the harbor all vessels have to cross the Hastings shoal by the Monkey Point channel, which is maintained by constant dredging, and can be entered at certain states of the tide by vessels up to 33-ft. draft, but these deep vessels cannot be accommodated to that draft, in the harbor, with a result they are obliged to complete their loading below the Hastings, where the commissioners maintain five swinging and six fixed moorings. The Hastings shoal is situated below Rangoon at the junction of the Rangoon River, the Pegu River and the Pazundaung creek, and for very many years has been a serious menace to the port of Rangoon. Erosion of the river bank for years has been taking place, and the Hastings shoal has at the same time enormously increased in size. A project of river training walls and dredging to secure a channel through the Hastings shoal was propounded in 1920 by the Commissioners' consulting engineers, Messrs. Meik and Buchanan, which was estimated to involve an expenditure of approximately 2 crores of rupees. The scheme did no more than propose to safeguard the existing inner harbor (the accommodation in which is already overtaxed), and the costly acquisition of foreshore sites now in commercial occupation would have been necessary in addition to provide an extension of port facilities.

Since the war a number of proposals have been made in connection with the port's development, and these have culminated in what may be described as the present chairman's Dawbon dock scheme. Mr. Cherry's scheme of future port development, which has been approved by a government conference, by the port commissioners, and in its general aspects by the Burma chamber of commerce, is a complete departure from any attempt to meet the problem of expansion by continuing on past methods. While retaining all the existing accommodation in the harbor and remodelling it to better advantage, it is now proposed to construct deep-water docks, available for entry at all stages of the tide, which will provide for overseas shipping without crossing the Hastings shoal. The land required for the purpose lies immediately to the east of Rangoon at Dawbon. The site is separated from the city proper by the Pazundaung creek, a narrow waterway some 600-ft. only in width—see Fig. 1. On the banks of this creek are numerous mills, on the Rangoon as well as on the Dawbon banks, and railway connection already exists between the provincial main line and Dawbon. The area to be developed approximates 2,000 acres and is at present low-lying paddy land entirely utilized for agricultural purposes, which it is anticipated will be inexpensively acquired. Out of this area some 600 acres are ear-marked for docks. As a beginning it is proposed to construct fifteen berths for large foreign-going vessels. Expansion over the whole reserved area will eventually provide a total of forty-eight berths. Adjacent to the docks will be a large area for produce, timber and mineral depôts, whilst between the "port" area and the city of Rangoon there will be approximately 1,000 acres available for housing and general industrial development. The whole will be adequately served by rail, affording direct connection between the docks and the main railway system of the province. The scheme is primarily designed to provide for rail-borne traffic, but eventually every facility for all kinds of port traffic will be given.

Two bridges are projected to connect Rangoon and Dawbon to carry tramways and vehicular traffic of every description. On the Pegu River side of the docks will be a depôt for inland vessels and for coal; the latter served by rail and by jetties for direct unloading and for bunkering by lighters. The outer entrance to the dock will serve as a tidal basin, in which the largest ships can lie in slack water before passing through the lock-way, and

will be approached by a short dredged channel with a depth of 35-ft. at L. W. S. T. The entrance lock will have a width of 80-ft. to 100-ft., and, alongside, a dry dock capable of taking the largest ships ever likely to visit the port will be provided. On one of the quays at the outer entrance a passenger station will be erected and connected with the main railway system. In the immediate vicinity land will be available for workshop sites, and the commissioners propose to establish their own workshops and slipways in the neighborhood of the dock entrance.

The completion of the Dawbon dock scheme will at once set free much foreshore on the harbor that has hitherto been earmarked for traffic development, and it will be possible to give necessary relief to the congested Indian, coasting and inland waterborne traffic by utilizing the facilities that have had to be reserved for the foreign traffic. It will also be possible to make adequate provision without further delay for the immigrant passenger traffic of the port. The Dawbon dock scheme proposals will be in augmentation of the existing port facilities, and moorings will be maintained in the harbor of vessels to load direct from lighters; but the volume of rail-borne traffic in mineral, timber, cotton, grain, seeds, etc., for overseas will steadily increase and will be diverted to the docks, where the adjacent depôts will provide godowns for the occupation of merchants, where re-bagging, cleaning, pressing, etc., operations will be possible.

In connection with the dock scheme Mr. E. C. Niven, M. Inst. C.E., chief engineer of the port commissioners, has put forward proposals for a modified scheme of river training in the vicinity of the Hastings shoal, which, at a cost of some 30 lakhs of rupees only, will, within seven years, restore the area lost by erosion and will improve the channel into the harbor by contracting the width of the Rangoon River. His scheme will, it is anticipated, be all that is necessary for the maintenance of the inner harbor, and will be in substitution of Messrs. Meik and Buchanan's two crores project.

A noteworthy feature of the new dock scheme is that it avoids the necessity for vessels crossing the Hastings shoal and the cost of making and maintaining a deep-water channel across it and into the inner harbor, which would involve large expenditure without providing any new source of revenue or increasing accommodation in the port. It is estimated that the Dawbon dock scheme will more than pay for itself, and will provide for unlimited and inevitable expansion of provincial trade. The scheme will directly benefit the cultivator and, it is anticipated, will have an immediate effect in a reduction of shipping costs. It is being projected in close association with the Rangoon Development Trust, which, for its part, will undertake development for housing and industrial purposes. The Burma Railways Company is wholly in favor of the project, as it will provide for railway expansion in a manner quite impossible in the present port of Rangoon. The government conference, presided over by the development commissioner, expressed unanimous approval of the project after a very careful discussion. The port commissioners, meeting after the government conference, unanimously accepted the general scheme and have approved of the necessary preliminary works, such as land and river surveys, substrata borings, tidal and current observations, and the preparation of a provisional lay-out. These works are now actually in hand, but it is anticipated that two years must elapse before actual construction can commence, and that it will be seven or eight years before the new dock will be in such a condition as to receive shipping.

Mr. Cherry, who has had in the elaboration of his project the assistance of Mr. E. C. Niven and the co-operation of Mr. C. Morgan Webb, C.I.E., I.C.S., chairman, Rangoon Development Trust, and Mr. H. V. Lancaster, F.R.I.B.A., town planning expert, has, with courage, enterprise and foresight, produced proposals which, when completed, will, it is anticipated, place Rangoon in the select list of the world's best equipped, most efficient and most prosperous ports.—*The Engineer.*

Harbin Tramways

A TRAMWAY system for Harbin seems assured. There has been much backing and filling, and there have been times in the life of the franchise when it looked as if the whole plan would he declared off says the *North China Star.*

But now an American engineering firm has taken the contract, and makes the statement that a great part of the material necessary for the construction has already been purchased in the Uuited States. The track laying will begin in April, if the ground has thawed sufficiently by that time, and by the end of 1922, the cars will be running. There are grave engineering problems to be worked out, especially in crossing the Chinese Eastern Railroad, which it appears must be a job of tunnelling.

The franchise which has been granted is on its face all in favor of the city, but there may be jokers, with which the public is not familiar. The franchise provides that the company must build the line within two years, and thirteen years thereafter must turn it over to the city as a free gift.

The company must pay the city thirty percent of the net profits for nine years and then for four years thirty-five percent. The city names men to draw salaries from the company and has equal voice in the management of the company both during the construction and operating periods, in addition to which the city fixes the tariffs, giving the city employes free rides and naming certain groups which shall get special rates.

It looks pretty soft for the city, but that is not all. The company guarantees the city a net income from its share of the net profits during thirteen years of not less than three million eight hundred thousand gold rubles, or expressed in U. S. dollars, $1,900,000.

The city names the streets, and under what conditions the cars may run on them. The city gets for the use of its buildings and for the streets, electric current without profit to the company, and the company builds for the city free of charge a fire singal system.

A special system of lighting equipment is to be erected in the principal streets of the city without cost to the city. Moreover, the company will lend the city, at the date of signing the contract, a half a million gold rubles, without interest, to be repaid to the company out of the city's share of the net earnings. It may furnish amusement for some banker to figure the interest, and the compounded interest, that will be involved in this loan.

The explanation of all this seems to lie in the fact that a Japanese company was in the market for the tramway franchise, and the Chinese company that secured it had to do some grand and lefty promising in order to keep their competitors out. The Japanese have an electric light contract with the city, and have an extensive system of wiring and poles on the Harbin streets.

The Japanese company that was after the franchise has filed a protest against the awarding of the contract to the Chinese, and it is provided that the electric light company will have to remove its poles from the city streets in order that the new concern may erect its equipment, and begin furnishing the city with light and transportation. The Japanese electric light contract is said to be terminable upon notice from the city.

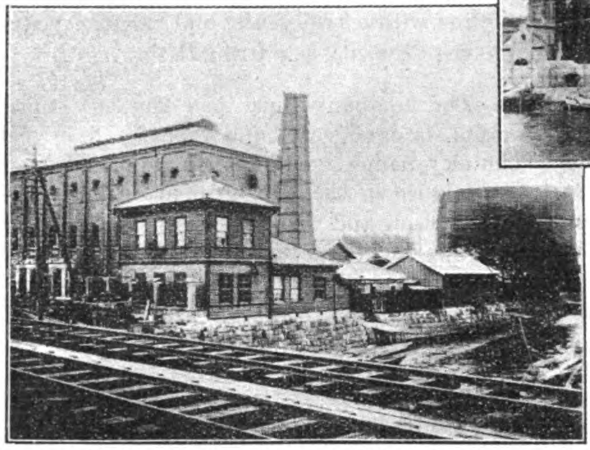
The entire situation seems fraught with opportunities of litigation, and with the apparent lack of definite knowledge of the lines of demarkation between the jurisdiction of the courts in this three cornered administered municipality, the legal fur will probably begin to fly in the near future. There may even be international complications.

Gas Industry in Japan

AT the end of 1920 there were 81 companies in all Japan which supplied gas, or gas together with electricity. The total investment in these industries was Y.254,-987,000. They consumed 774,626 tons of coal in 1920, and produced 10,153,169,957 cu. ft. of gas, sold to 493,036 houses.

In 1889 there were only two gas companies in Japan. Their capital paid up was only Y.310,000, and they supplied only 1,049 houses with 91,000,000 cu. ft. of gas. By 1905 the number of companies had increased to seven, in which Y.7,900,000 was invested and they supplied 37,679 houses, with 883,000,000 cu. ft. of gas.

The investments in gas companies increased rapidly after the Russo-Japanese war, and in 1910 there were ten companies operating, capitalized at Y.27,580,-000 paid up, which supplied 117,616 houses with 3,546,-000,000 cu. ft. of gas.



By-Products Works of the Tokyo Gas Co.

Reach Country Districts

From 1910 to 1912 the extension of gas works to small country districts had been greatly developed and in 1912 there were 74 companies in which the total investment was Y.52,630,000, supplying 4,360,000,000 cu. ft. of gas to their consumers.

In 1915, at the end of March, the number of companies had increased to 87, capital invested to Y.80,790,000, and the quantity of gas supplied to 5,327,000,000 cu. ft. The later progress of the industry is shown in the following table :—

Year 1916	No. of companies	Capital Yen	Gas supplied cu. ft. Yen
March 31 ..	.. 91	86,870,000	5,435,000,000
1918	.. 72	109,270,000	7,919,000,000
1919	.. 82	unknown	9,420,000,000
December 31, 1920..	81	154,990,000	10,153,000,000

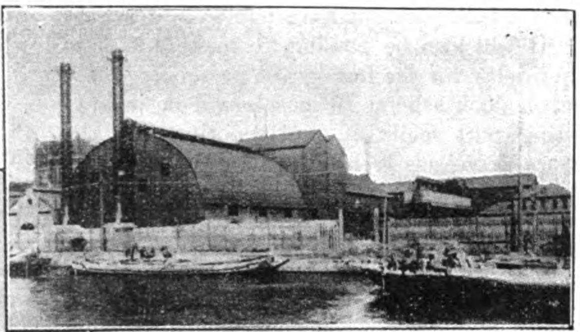
supplying 493,036 houses.

The Nagoya Gas Works

From these figures it can be seen that the expansion of the gas-producing industry has been extraordinary especially from 1908 to 1919.

Used for Power

The end of the Russo-Japanese war witnessed a boom in the promotion of industries and with the rise of new factories all over the country, the demand for gas increased for use in engines. At the same time demand for better lighting grew and gas became more and more popular. Naturally in all the important industrial centres the gas industry expanded, and between the two years 1910 and 1912 the investment in gas companies doubled, while the number of companies producing gas increased 700 per cent.



The Senji Works of the Tokyo Gas Co.

Post-War Projects

Since the Russo-Japanese war (say 1906) the important new gas companies that have been organized are:

Name	Year Organized
Kyoto Gas Co.	November 1909
Nagoya Gas Co.	November 1906
Hiroshima Gas Denki Co.	October 1910
Chosen Gas Co.	October 1910
Bishu Denki Co.	April 1909
Chida Denki Co.	February 1910
Nara Gas Co.	December 1910
Okazaki Gas Co.	April 1910
Shizuoka Gas Co.	June 1910
Akashi Gas Co.	May 1912
Fukuyama Gas Co.	December 1911
Toyohashi Gas Co.	October 1909
Wakayama Gas Co.	April 1911
Sakai Gas Co.	March 1910

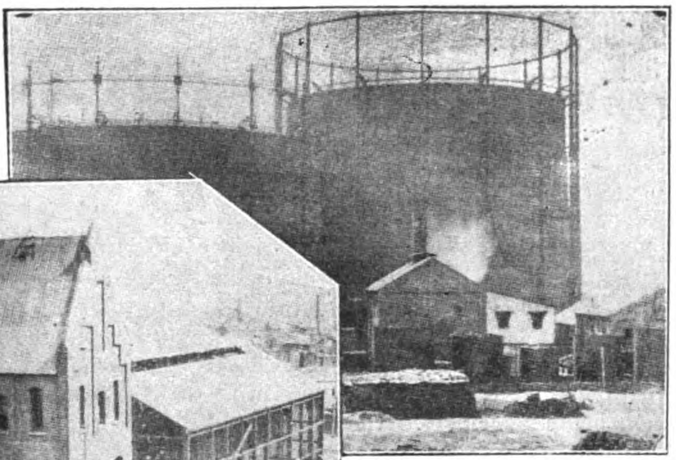
Besides these important companies small scale concerns were established all over the country. At the same time there was a conspicuous expansion of electric light companies. Demand for light was increasing, and another reason was the very profitable showing all the old-established companies had been making for years past.

For instance the Tokio Gas Company, established in 1900, and the Osaka Gas Company, established after the Russo-Japanese war, had always shown net profit of 18-20 per cent. on the money invested. In those times before the European war 18-20 per cent. net profit on paid-up capital was considered a splendid investment return, and naturally that high rate of profit attracted universal attention from the investing classes.

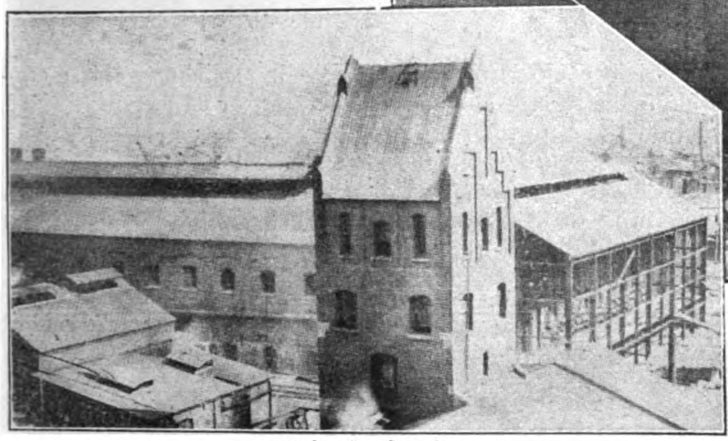
Popular on Market

One of the results of this was to make the shares of the Tokyo Gas Company very popular on the stock exchange, and to place them in the front rank of speculative shares, along with Kanegafuchi Boseki, Tokyo Dento, and the stock exchange shares themselves. And this popularity on the stock exchanges, reacted on the promotion field and made the promotion of gas companies very popular indeed.

With 1912 the first period of expansion of the industry seems to have come to an end. But after the beginning of the European war a second

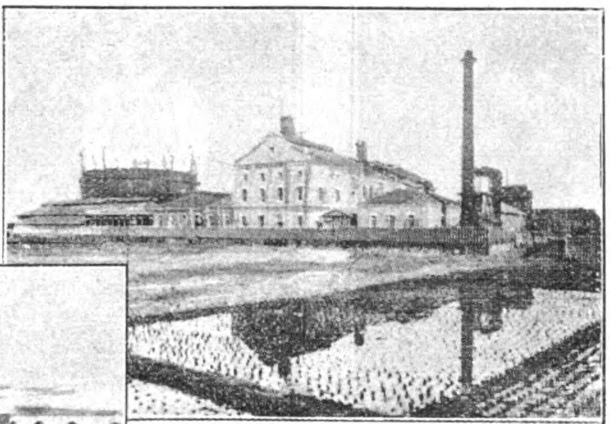


Osaka Gas Tank

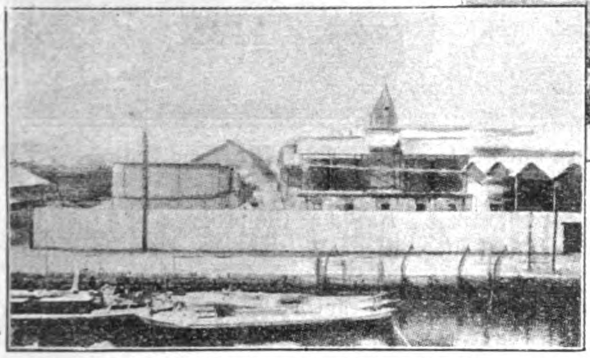


Osaka Gas Works

period of expansion set in, while new companies were again promoted. But with the war the price of coal began to advance and this made the industry more difficult to operate at a profit. Before the war coal was



The Fukugawa Works of the Tokyo Gas Co.



The Shiba Works of the Tokyo Gas Co.

usually Y.50 per 10,000 *kin* (13,333-lb.), but in 1917 it rose to Y.160 and in 1919 it was Y.230,240. During and after the Russo-Japanese war the price of coal rose 60 per cent., but during the European war it rose 200 and even 300 per cent. in price.

Gas companies are public service corporations, and most of them had contracts with municipalities, and country districts for selling certain fixed amounts of gas for long periods at a fixed price. Naturally these contract prices could not be increased. So newly established companies without any reserves, found themselves in difficulties from which they were unable to extricate themselves. While the old established companies were much upset, they were able to go on existing from the sale of their by-products, which were selling at enormously high prices.

Reforms at Osaka

Recently the charges made by the Tokyo Gas Company and the Osaka Gas Company, have been the targets for attacks demanding reforms. These companies had city contracts, and in Osaka in order to get permission to raise the price of gas to Y.3.00 per 1,000 cu. ft. the company was obliged to submit to certain conditions imposed upon its future operations. The number of houses supplied must be increased 500 monthly: the amount of gas mains laid must be increased in proportion and from September 1 no charge for metres was permitted.

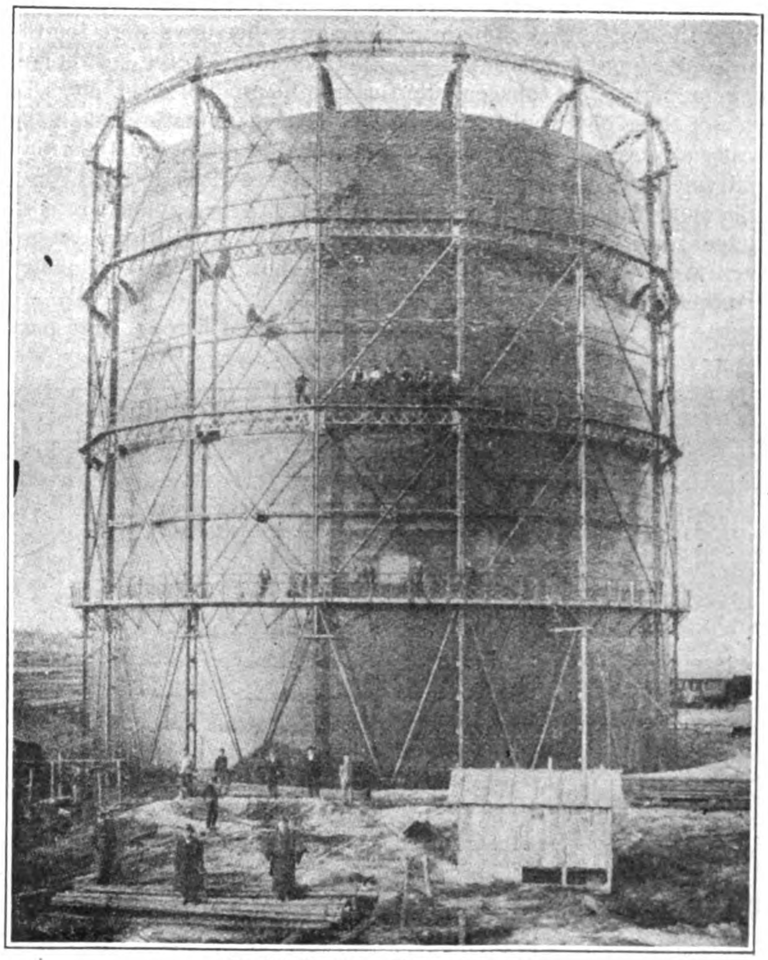
As the cost of coal decreases gas companies naturally must decrease their charges. But if the cost of coal rises, then their incomes will decrease, and they will be obliged to raise their charge again. If present contracts with the municipalities are not subject to cost changes with the rises and falls in the price of coal, the gas companies will probably find themselves hard hit at some not distant time, if the wishes of the coal companies can be realized.

From one point of view Japan's gas industry seems to have reached its topmost height. Of course, hereafter demand will increase, and supply will also increase, but the rate of increase will not be very great nor very fast. Sooner or later the extension of the electric light companies, and power companies will react on the gas companies and their profits will fall. Then there will come a shifting of capital to electric enterprises now actually going on.

Automotive Development

The Tsing Pei or Northern Shansi Automobile Transportation Company is being organized at Taiyuanfu with a capital of $20,000.

Mr. Wang Chi-liang is promoting an automobile transportation company at Hankow to operate a service on the outskirts of the city.



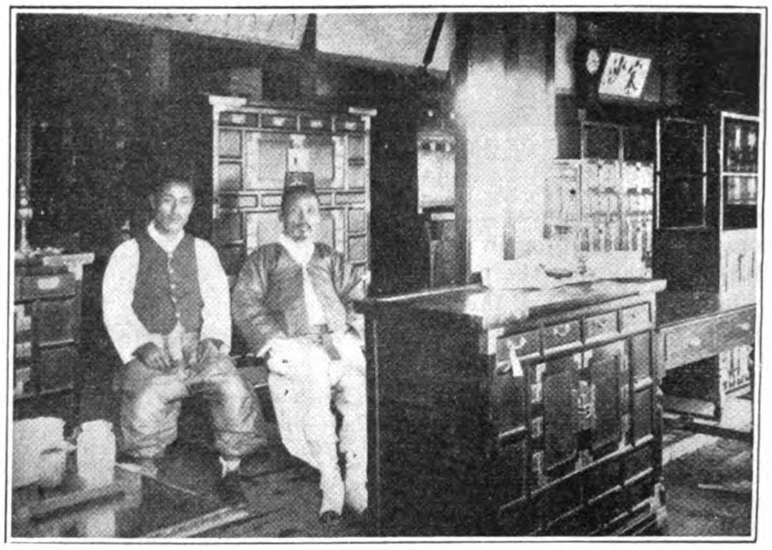
Gas Tank of the Nagoya Gas Co.

Korean Industries

By T. Hoshino

KOREAN industries are mostly of a very crude nature, some being hardly worthy of the name, requiring neither a large capital nor great technical skill. This state of affairs will continue for a considerable time yet, seeing that the articles requiring either or both of these for their manufacture can be imported from Japan with advantage, unless there are special reasons in favor of their being made here. Hence the works that came into being in earlier days were for the most part connected with rice-cleaning, smelting of ores, cotton ginning, preparation of tobacco, brewing and the production of salt. To some of these one would grudge the name of manufactures, as being simply a process in the preparation of raw materials, but they may be termed manufactures in that they are carried on in distinct mills or factories, by persons who are not producers, and are conducted more or less on the lines of the modern factory system. Even these rough kinds of manufacture, however, present plenty of scope for development, since, for example, most minerals are exported in the form of ores whereas, if smelted here, a large part of their freight could profitably be saved. In short, the manufacturing industry of Chosen is only just out of its primitive stage, and we must look to the future for its great development.

Korean Brasswork is Famous for its Excellence

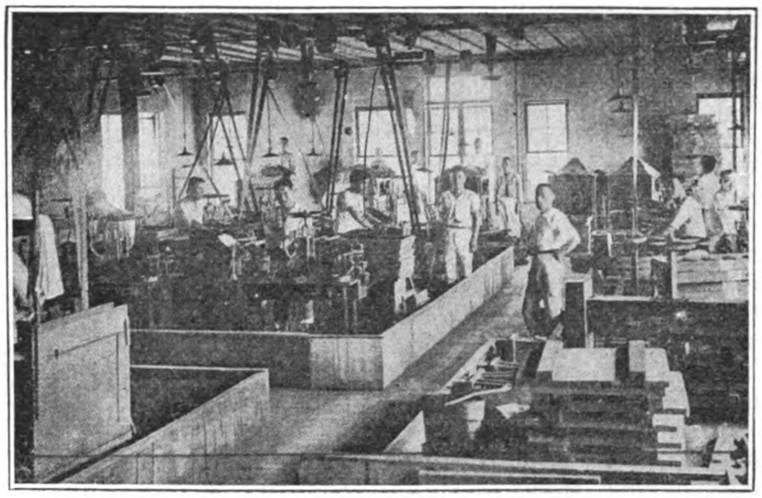


The Korean Chest is Prized as a Work of Art and Utility

Growth of Factory System.—As in the case of most new countries, of which Chosen is one when speaking economically, a feature in the economic progress of the peninsula is the passing over of many of the intermediate stages through which one system has developed into another in older countries. Rapid as the progress of Japan has been, it has not been half so sudden as in the case of Chosen. For instance, in the silk industry, many stages were passed through in Japan before it reached the present factory system. The domestic system was long in vogue there, during which many homes were provided with hand-reeling machines, and the cocoons they produced were made into silk before appearing on the market, or else the cocoons to be reeled were given out by entrepreneurs to their employees who did the work in their own homes. But in Chosen, all such intermediate stages have been skipped over. It is but a few years ago since cocoons began to figure in the list of

77,000,000 yards of Cotton Cloth are Woven each Year by the Patient Women of Korea

A Korean Pottery Market



The Toa Tobacco and Cigarette Factory at Seoul, now Operated by the Government Monopoly Bureau

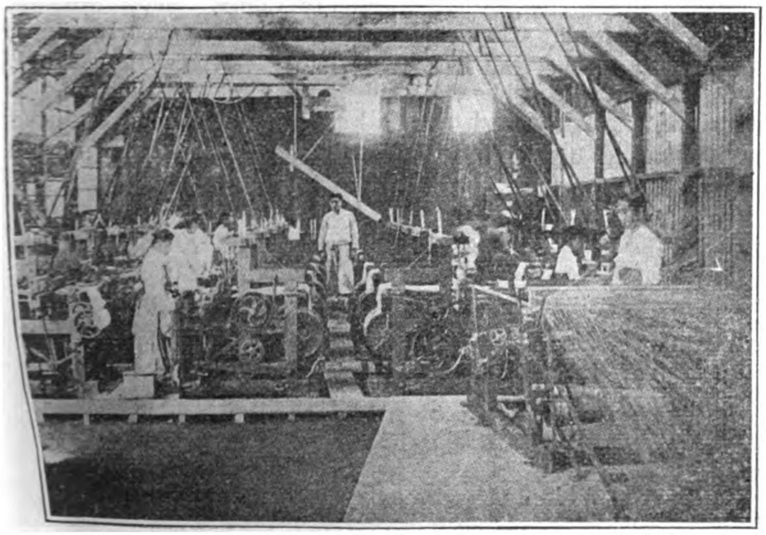
exports, and already we have here silk factories as well equipped as any in Japan, though on a very small scale. Thus many processes for preparing raw materials which are performed in individual homes in Japan are done in Chosen in factories, with the result that factories have increased very rapidly in recent years, as shown in the following table:—

Year	Number of Factories	Capital	Motive Power		Value of Products
			Number of Engines	Horse Power	
		Yen			Yen
1911	252	10,613,830	148	6,058	19,639,655
1912	328	13,121,481	205	8,069	29,362,307
1913	532	17,478,146	319	9,908	36,066,172
1914	654	17,371,832	319	13,278	32,754,797
1915	782	21,113,607	405	16,252	45,931,133
1916	1,075	24,613,500	459	17,460	59,026,639
1917	1,358	39,038,966	619	26,170	98,972,187
1918	1,700	48,309,485	714	26,151	156,801,630

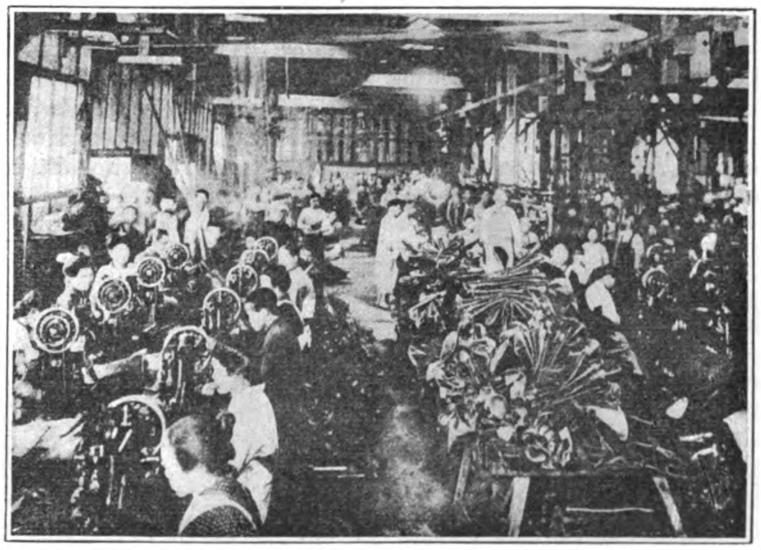
Thus it is seen that during the past seven years the number of factories has increased by more than 575 per cent., capital by about 355 per cent., and the value of production by 698 per cent.

Korean Manufactures Classified.—The following table gives the various kinds of manufactures, the number of factories for each, the amount of capital invested, and their production according to the statistics for 1917, also the nationalities of those engaged in their manufacture:—

	Nationality of Owners	No. of Factories	Capital	Value of Products
			Yen	Yen
Dyeing and Weaving	Japanese ...	15	99,750	117,579
	Koreans ...	68	221,390	511,975
	Total ...	83	321,140	629,514
Spinning	Japanese ...	2	43,000	40,125
Cotton ginning	Japanese ...	19	6,752,239	6,073,075
	Koreans ...	2	15,000	100,098
	Total ...	21	6,767,239	6,143,173
Pulp	Japanese ...	1	?	129,600
Paper	Japanese ...	3	15,000	14,516
	Koreans ...	51	15,886	58,022
	Total ...	54	30,886	72,538
Tanning	Japanese ...	8	1,991,036	3,531,663
	Koreans ...	37	52,900	229,193
	Total ...	45	2,043,936	3,760,802
Ceramics...	Japanese ...	67	506,500	631,944
	Koreans ...	115	137,720	169,350
	Total ...	182	644,220	801,294
Soap	Japanese ...	10	117,700	169,178
Candles	Japanese ...	4	29,500	301,000
Matches	Japanese ...	1	7,000	30,000
Dye-stuffs	Japanese ...	1	40,000	98,437
Artificial manures	Japanese ...	4	280,000	165,012
Metal ware	Japanese ...	57	279,270	1,590,729
	Koreans ...	106	202,250	378,695
	Total ...	163	481,520	1,969,424
Carpentery	Japanese ...	14	81,510	102,636
	Koreans ...	19	32,867	76,656
	Total ...	33	114,377	179,292
Lumber	Japanese ...	16	396,000	1,130,195
Shipbuilding	Japanese ...	8	54,500	90,779
Rice-cleaning	Japanese ...	143	3,549,766	41,517,861
	Koreans ...	154	546,420	5,855,153
	Total ...	297	4,096,186	47,373,014
Flour milling	Japanese ...	9	133,140	168,062
	Chinese ...	1	500	4,500
	Total ...	10	133,640	172,562



Matting Factory, Seoul



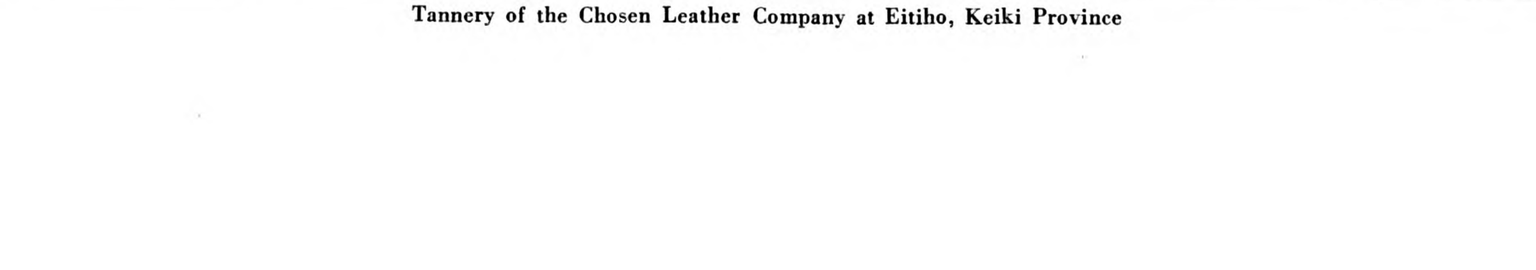
Tannery, near Seoul

Government Saw Mill and Lumber Yard, Shin-gishu

	Nationality of Owners	No. of Factories	Capital	Value of Products
			Yen	Yen
Tobacco	Japanese ...	21	2,214,413	6,016,332
	Koreans ...	5	211,880	539,627
	Total ...	26	2,426,293	6,555,959
Brewing	Japanese ...	108	1,968,485	1,835,318
	Koreans ...	6	101,000	97,216
	Chinese ...	3	23,000	53,363
	Total ...	117	2,092,485	1,985,897
Salt	Japanese ...	15	398,150	676,773
Canning	Japanese ...	23	301,631	450,543
Printing	Japanese ...	59	617,965	1,400,014
	Koreans ...	11	103,110	65,540
	Total ...	70	721,075	1,465,560
Tailoring	Japanese ...	12	91,050	341,950
	Koreans ...	22	214,150	248,528
	Total ...	34	305,200	590,478
Smelting of ores	Japanese ...	26	8,832,555	14,801,381
	Koreans ...	2	15,000	10,330
	Foreigners	7	2,207,582	5,975,230
	Total ...	35	11,055,137	20,786,941
Gas and electricity	Japanese ...	17	4,402,548	2,176,297
	Jap. & Kor.	3	384,733	134,769
	Foreigners	1	850,000	14,442
	Total ...	21	5,637,281	2,325,508
Others	Japanese ...	73	457,650	800,626
	Koreans ...	7	13,220	23,418
	Jap. & Kor.	1	25,000	22,000
	Chinese ...	1	5,000	2,545
	Total ...	82	500,870	848,589
Total	Japanese ...	736	33,660,358	84,401,585
	Koreans ...	605	1,882,793	8,363,753
	Jap. & Kor.	4	409,733	156,769
	Chinese ...	5	28,500	60,408
	Foreigners	8	3,057,582	5,989,672
	Total ...	1,358	39,038,966	98,972,187

It will be seen from the above table that, in the amount of capital invested, the smelting of ores occupies the foremost place with Y. 11,055,137, and is followed by cotton ginning with Y. 6,767,239, and by gas and electricity, rice-cleaning, tobacco manufacturing, brewing and tanning in order, while as regards nationalities Japanese play by far the most important part, providing 86 per cent. of the capital and turning out 85 per cent. of the total value of production. The inactivity of the natives in the manufacturing field is regrettable, but they, too, are awakening, and it will not be long before they figure very largely in this new phase of economic activity.

Native Industries.—Of the native industries, in which the Koreans made considerable progress at one time, what now remain are weaving, ceramics, paper-making, brewing, metal working and a few others. The weaving of cotton is mostly carried on by the country women at home, yet its production during 1917 is estimated to have reached 3,400,000 pieces (76,613,000 yards). Recently small factories have sprung up for the carrying on of this work on a larger scale. Silk weaving is also carried on in some localities, but its annual production hardly exceeds 210,000 pieces (4,732,000 yards). Hemp-weaving is only next in importance to that of cotton, and its annual production is considered to be about 2,600,000 pieces. The statistics for 1916 show that the total production of cotton tissue in that year amounted to Y. 3,630,000 in value, that of hemp cloth to Y. 3,670,000, that of silk to Y. 740,000 and that of mixed tissue to Y. 60,000. The art of ceramics in which the Koreans once exhibited great skill has long died out. But the revival of this lost art seems dawning, as is shown by the fact that some Koreans have already established factories on a fairly large scale for this purpose, of which the most noted is the Pyengyang Porcelain Factory. The report for 1916 puts the total production of earthenwares, porcelain and unglazed pottery in that year at Y. 850,000, glass wares at Y. 70,000, earthen pipes and bricks Y. 640,000 and lime at Y. 60,000. The manufacture of native paper has survived modern mills, the Korean paper having a peculiarity of its own which the primitive method they employ alone can give. The annual production amounts to Y. 1,500,000 of which about Y. 100,000 is exported to China. Metal working has been extensively conducted in Korea since very early times, brass utensils being very largely used in the Korean household. They still exhibit considerable skill in this art. Brewing is also extensively carried on and the total quantity of liquors produced is estimated at about 40,000,000 gallons. Among other native



Tannery of the Chosen Leather Company at Eitiho, Keiki Province

industries, the manufacture of *wangol* goods is very promising, the *wangol* being a kind of reed peculiar to Chosen, growing in marshy places, with which the farmers made matting from early times. Of late, various articles, baskets, hats and fancy goods, are being made of it, and in 1916 the total production amounted to Y. 490,000 in value. On the whole, it may be said that the native arts and industries are being fostered with the utmost care and have made some progress. But the real progress is seen in the new type of manufacture introduced by the Japanese and conducted on the factory system of which a brief description is given below.

New Industries.—A feature of the new industry is, as we have observed before, its being conducted according to the factory system, and that its products are intended rather for export than for home consumption. The great majority of the Korean people, considerably advanced as they are in their standard of living as compared with some years ago, need but few things besides what they make by their own hands, and the Japanese and foreigners in the land are yet too few to need to retain much for their own use. The result is that a great part of what is produced by the new industry, as we call it, is exported abroad. There are, of course, some exceptions, the notable one being tobacco, the greater part of which article is consumed in the country. Yet, even in this case, the export of cigarettes to China is increasing yearly. Another feature is that it is almost exclusively undertaken by Japanese. A glance at the foregoing table of Korean manufactures classified will convince the reader of this fact. This is but natural, seeing that the Japanese are the richer and more enterprising of the two predominating populations of the country, and especially in view of the fact that the destination of the articles manufactured is mostly Japan.

The more important of these new industries are listed in the same table quoted above, the principal ones being smelting of ores, cotton ginning, gas and electricity, rice-cleaning, tobacco manufacture, brewing, tanning, salt manufacture, etc. There are still others which do not appear in the list at all, or, if they do appear, the figures relative thereto are very insignificant, and yet they are of paramount importance on account of the great future they are considered to have in store. These are the manufacture of flour, sugar, pulp, cement, porcelain and matches, and spinning.

Below we give a general survey of the manufacturing enterprises in the peninsula.

Iron works on an extensive scale have just been founded in the Peninsula by the Mitsubishi firm at Kyumipo in Whanghai province. When completed it is estimated the foundry will produce 100,000 tons of pig iron, 62,000 tons of ingot iron and 73,000 tons of iron plates, bars, etc., together with a large amount of by-products. The supply of ores to the foundry is to be drawn from the company's own mines, six in number and covering an area of 10,000,000 *tsubo* (8,169 acres) altogether, and from other mines in the neighborhood. These and other works in this line are considered to be highly promising on account of the plentiful supply of materials. The manufacture of pulp was begun some six years ago by a Japanese who made use of reeds as material, but it is only recently that public attention has been called to this important industry by the establishment of a large joint-stock company in Shinwiju with a capital of Y. 5,000,000. The famous Yalu timber will be made use of as material, and when the factory is in working order it is expected to turn out about 30 tons of pulp daily, or about 10,000 tons a year. The growth in the manufacture of pulp will, it is considered, further encourage the manufacture of paper, for which the country has been famous from of old. Tanning is considered one of the most hopeful industries in Chosen on account of the presence of hides of excellent quality in large numbers. One large tanning company was established in 1911 at Yung-dung-po with a capital of Y. 1,000,000, and this has since been engaged in the making of leather belting, sole-leather, harness leather, box calf, etc., by the process of oak and chrome tanning. The company received large orders for military boots and cartridge pouches from the Russian government during the European war, which at one time amounted to quite considerable figures. Cotton spinning and silk manufacture have also a good prospect because of the increase in cotton growing and in sericulture. Great hope is also entertained as to the future of the tobacco industry since the annual consumption of tobacco in the peninsula amounts to Y. 6,000,000. The largest tobacco factory is the Toa Tobacco Factory in Seoul with branch factories in Pyengyang and Chunju. The output of this company has not only succeeded in ousting the imported cigarettes from Japan and Shanghai, which until quite recently monopolized the Korean markets, but is exported in goodly amounts to Manchuria. The manufacture of sugar is also considered very hopeful. Experiments have shown that the sugar-beet grows excellently in Chosen, and an attempt at the establishment of a sugar factory was made in 1912, which, however, failed to be carried through. Recently a large sugar factory has been established in Pyengyang with a capital of Y. 5,000,000 by Japanese and Koreans jointly. If it succeeds, Chosen will have another important branch added to her industry. Enterprises of various other kinds, notably in chemicals, are being contemplated, some are under promotion, and some are already organized. Such are the manufacture of soda, for which the cheap Korean salt obtained by the process of spontaneous evaporation is available as material, the manufacture of oils and fats for which the country furnishes plenty of material in the form of fish and vegetable oils, of pottery by making use of the abundant kaolinite found in the peninsula, and of glass, in the making of which the native siliceous sand is to be used.

Government Enterprises.—The government of Chosen conducts several industrial enterprises such as the manufacture of briquets by the Pyengyang coal mining station, the saw mill attached to the lumber station in Shinwiju printing at the printing bureau in Yongsan and the manufacture of salt by the salt-manufacturing station at Kwangyangman and Chooan. Of these, the first two items have already been touched upon in the preceding chapter under the headings of mining and forestry respectively. Printing, the third, is too trivial in character to be dealt with at any length in such a work as this. Suffice it to say that, besides the government documents largely printed by the bureau, the Bank of Chosen notes, circulating at this time to the amount of over Y. 150,000,000 in Chosen and Manchuria, are also printed by it. The fourth, that is the manufacture of salt, needs some description because of its being one of the principal items of the manufacturing industry of Chosen.

The government salt-pans for natural evaporation at Kwangyangman and Chooan covering in all 2,526 acres, were completed in 1913 and have ever since been supplying the peninsula with this much needed commodity. The following table gives the area of the basins, their yield, and the receipts during the last nine years:—

Year	Area of Salt Basins Acres	Quantity Produced Pounds	Quantity Sold Pounds	Value Yen
1910	219	1,317,804	1,357,758	4,606
1911	1,415	5,966,390	3,477,249	18,382
1912	2,334	19,818,118	14,977,687	73,758
1913	2,526	56,201,622	20,783,937	63,104
1914	2,526	64,457,793	48,222,928	104,171
1915	2,526	68,581,186	69,679,614	222,868
1916	2,526	94,414,550	58,678,008	197,706
1917	2,528	117,182,683	?	?
1918	2,528	102,396,141	?	?

It is to be noted that, in spite of the progress made by the government salt-pans, they are hardly yet in a position to supply even half the demand for salt in the peninsula, which demand is rapidly growing, making it necessary to import a great amount of foreign salt. The total amount of imported salt in the fiscal year 1918 reached over 376,425,000 pounds, valued at Y. 1,502,000, which shows an increase of 84,092,478 pounds, valued at about Y. 500,000, over the preceding year. Among the different kinds of imported salt, Chinese evaporated salt coming from Shantung led the rest in 1918, amounting to 328,367,552 pounds in quantity.

Modern Progress in the Province of Fukien

By Rev. J. E. Walker

WHEN the empress-dowager inaugurated her plans for a general system of modern education, Foochow city responded promptly, as did in greater or less degree all other cities on the Min River. Buildings for the various schools were erected or remodeled in Western style on a liberal scale, and schools of the several grades were opened. Various influences had prepared the way for this; and not the least were the three mission "colleges" at Foochow. A start in teaching of English and Western sciences had been made by the Anglo-Chinese College as far back as 1881. This was located in Nantai, the foreign settlement, three miles south of Foochow city. Not long after a mission school in the city also took on these branches, though on a smaller scale; and the two reached a larger constituency than would the more distant one alone have done. St. Mark's College, though the third one to take up these branches is now doing so on a large scale. The three have drawn in students from the whole province, especially the northern and central parts. Quite a number of graduates from these schools have pursued further studies abroad, and are now filling various positions at home as professors, doctors and in official positions. Two years ago two Americans were at a little feast given by returned students. Dainty Chinese courses in elegant Chinese dishes were partaken of with chop-sticks; but the lively conversation was carried on in faultless, fluent English.

At the present time the province is divided between north and south along the line of the Min River. Foochow, and everything north of this river is under the north, and everything south is under the southern government. This hinders progress very much.

Among other enterprises was a modern hospital well housed in a two story brick building, and fairly well equipped. Dr. Margaret Ling was put in charge of it. She was the daughter of a former Foochow pastor, had graduated from the Foochow College, and then had gone to America where in due time she graduated from Chicago Medical School which is connected with the Illinois State University, and was well qualified for the position. But mismanagement of funds wrecked the institution; and it was closed about a year and a half ago. An offending manager committed suicide.

One remarkable advance at Foochow has been the opening of the horse road from the end of the Long Bridge (Wan-shou Ch'iao) to the city, and on into the heart of the city. This shows how thoroughly the old bondage to "*Feng Shuei*" is broken. The South Gate was the dragon's mouth, and the white pagoda on the east and the black pagoda on the west were the dragon's horns. The ground in and about the South Gate was so low that in case of a flood in the river it would be overflowed to a depth of one to five or even to ten feet.

The horse road was begun in the fourth year of the republic and was finished in the seventh. It first turned east from the head of the Long Bridge till it reached the outside of the suburbs, then pursued a general northerly course for about two miles, then turned west till it reached the Water Gate by which it entered the city.

From this point it was extended into various parts of the city. It was finished in the seventh year of the republic, was soon well supplied with jinrikshas, and much patronized by the well-to-do. But all foot travel between the city, the south suburbs and the foreign community went by the shorter South Street; and then this also was opened to the horse road. A gap was made right through the city wall on the east side of the South Gate, the low ground in and about which was filled up till the gate was closed to all travel. The shops facing on the street retracted their fronts to make a street wide enough for three autos to go abreast; and now horse carriages and autobusses dash along the once sacred South Street. The jinrikshas also run out through the West Gate up to the Upper Bridge (Yun-shan-ch'iao); and in time they will be running down the river to the anchorage.

There is talk of a highway to extend clear across the province to the head waters of the Min, and then from there over the divide into the Kiangsi province. This will come when the country is united again under one good government. The influence of the waterworks, electric lighting and widened streets is felt all through the Min valley; and beginnings along these lines have appeared at various points in the interior. The whole province is rich in water power, now all running to waste. But the old superstitions are breaking down; and the people are ready. All now waits on capital; and capital waits for confidence in an established government acceptable to the people.

Min River conservancy is an enterprise which aims to provide a thirteen-foot channel from the anchorage to the bund of the foreign settlement on Nantai Island, distance of nine or ten miles. Work was begun nearly three years ago and much has been accomplished. A large capital was borrowed to begin with, and a large yearly income provided for through a surtax on shipping and goods from both the maritime and native customs. For the second year ending February 28, 1921, the sum derived from these sources was $110,659.30. According to the report issued for the second year by the conservancy executive committee, it began with $688,436.58 and closed with $674,336.51 balance on hand.

New shore is built up by means of bamboo and broken stone dykes; and in the course of a year or two the banks attain a sufficient height to warrant their being faced with broken stone, and thus rendered permanent. The stone is taken from a quarry conveniently located on Kushan Point about midway between the two termini. A flood of unusual violence beginning June 26, 1920, severely tested the strength of the work as so far carried on, with but little damage resulting. Foochow's supply of bamboos comes mainly from a region on the Yung-fuh river; and banditi at times hinder the prompt and full supply of bamboos. The conservancy commission had purchased the site of the quarry as government property; but as soon as they began work, several parties from a near-by village claimed ownership of part of the site, but were content with contracts for quarrying the stone from their own sites at the same prices as the original contractor. At the start river boats and boatmen were hired to deliver the broken stone; but they made so much hinderance with strikes, etc., that the commission had ten pontoons built; and now for the past year the work has been going steadily forward with increasing rapidity.

The executive committee consists of Mr. Ling Ping-chang, Chinese delegate; Mr. G. C. Hanson, American consul, representative of the consular body; Mr. Percy R. Walsham, commissioner of customs, honorary secretary and treasurer; Mr. H. von Heidenstam, royal Swedish corp of engineers, consulting engineer; Mr. J. R. West, M. AM. SOC. C.E.E., engineer-in-chief. The secretariat and official staff consists of Mr. S. T. Polk, assistant secretary, and four Chinese; and there is a technical staff, consisting of Mr. J. G. Grant, superintendent of works, and fourteen Chinese, surveyor, draftsmen, cadet engineers, overseers, etc.

The government has opened a number of trade schools; also two schools of agriculture, one for young men and one for young women. There are also primary, higher primary and middle schools with a large enrolment of students: also a commercial school, a mining school, a foreign language college, a normal school, boys and one for girls; also here and there kindergarten schools. But it is with great difficulty that the schools are kept going for lack of money. A union college of the three missions has a little over 100 students.

At Amoy Mr. Tan Kak-hee has given millions for the founding of an university; and Mr. Lim Boon-king of Singapore has been elected president.

The most important thing, and one that does not appear on the surface is the changed attitude of the Foochow gentry toward everything Western. There is this "the promise and potency" of yet greater things to come.

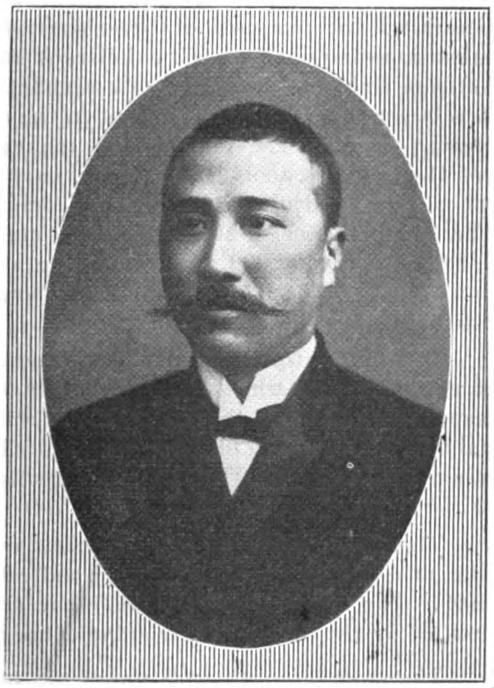
Commission Government in Canton

By Orrin Keith

THE cities of China have from time immemorial been administered by the authorities of the province in which they were situated. They were merely a part of the province. Such a thing as a municipality was unknown. The governing of a huge city, like the administration of justice or the command of an army, was considered to be entirely within the competence of the classically educated mandarin.

Students of political science returning from America brought the information that in that country city administration was considered a highly specialized study; that men devoted as much time and labor to the understanding of the problems of municipal administration alone as the scholars of old gave to their whole series of degrees. City problems were not a mere phase of provincial organization. They required separate treatment and separate organs of administration. In short, city government was in a sphere of its own and should be removed entirely from the control of the provincial authorities.

This line of reasoning, however, had no attraction for the members of the mandarinate. The provincial governors realized full well that the largest share of their revenues came from the large cities in their provinces. They were not minded to give up these revenues to humor the whims of Western knowledge and to furnish material upon which returned students might try experiments with results which no one could foresee. If the ordinary mandarins refused to sacrifice cash returns for the advancement of political science in China, it was hardly to be expected that the anamolous individuals known as tuchuns would be more favorable inclined. Not for a moment! Cities existed to furnish money, not to be well governed.



General Chen Chiung-ming, Governor of Canton.

Wu Ting-fang, the veteran diplomat, now directing the Foreign Affairs of the Canton Government.

In the South, however, was found a tuchun of another mould. As soon as General Chen Chiung-ming had succeeded in driving out of Canton the defeated armies of the Kwangsi militarist party and had re-established parliamentary government in Kwangtung, he gave ear to the suggestions of a young man who had devoted his years of study in America to the science of municipal government. This young man was Sun Fo, son of Sun Yat-sen. He had pursued his studies first at the University of California and then at Columbia. He was filled with the desire to see his city of Canton placed under a modern administration and he pled with the governor to grant the city a charter.

The governor complied with his wish and Sun Fo and several of his associates set to work upon the draft of a charter. There were many problems to be dealt with which had never come up in connection with American cities so that some originality was demanded. The new charter could not be a mere copy of selected provisions from American documents. It was soon completed, however, and presented to the governor for his action. On December 23, 1920, Governor Chen promulgated the provisional charter of the city of Canton, the first municipal charter in China.

The document is an admirable example of brevity in state papers. It fills but eight printed pages and its logical order and clear definition are equally commendable. It is a tribute to the training of its author. In another point it is a departure from the precedent of Oriental constitutions. The ultimate control being frankly retained in the hands of the civil governor, there is no attempt to hide or disguise the fact. The people of Canton have had no experience in electing officials nor in administering their own affairs and the provisional charter gives them an opportunity to take over these responsibilities gradually.

The first unusual problem which presented itself was to determine what was the city of Canton. The old system required no line of demarkation between the city and the surrounding country so the city had no recognized boundaries. The first chapter of the charter therefore provides for a city boundary Commission which shall define and fix the area and boundaries of the city. This commission is appointed by the civil governor so that there will be no undue encroachment on the province. After the boundaries are fixed, the city may extend its area with the consent of the civil governor but no territory once included within the city can be separated and establish itself as a separate municidality. The area thus determined is declared a loacl government directly under the provincial government and independent of the hsien administrations.

The sphere of municipal activities is a large one and includes practically everything which pertains to city government in America. Finance, highways, sewers, public health and amusement, public safety and fire prevention, education charity, communication, transportation, water, gas, and light, city properties, a city census, are especially listed as among the functions of the new government. In addition other matters and affairs may be assigned to it by the central and provincial governments.

The powers of the new government are exercised by a commission of seven known as the municipal executive council. This council consists of the mayor and the commissioners of the six established departments: Finance, public works, public safety, public health, public utilities, and education. The council governs its own

proceedings, and its action upon any question within its jurisdiction is apparently final, even the civil governor being powerless to interfere.

It is the intention ultimately to have the mayor elected by the people of the city. For the first term of five years, however, and until the people have some experience in electing civic officials as provided elsewhere in the charter, the mayor is appointed by the civil governor. Quite appropriately General Chen conferred this appointment upon Sun Fo, not because he was the son of President Sun, but because he was the man obviously qualified to fill the position.

The commissioners are appointed by the civil governor upon the recommendation of the mayor. The first commission is composed entirely of returned students who have made municipal administration their specialty in the universities of other countries. Three, beside the mayor, are from America, two are from Japan, and one from France.

The department of finance has charge both of the assessing and the levying of taxes, the control of city properties, the management of municipal loans, and the general collection and payment of city funds. There are at present no loans in existence though one, a large one, is contemplated in connection with the plans for the extensive development of Canton as a sea-port and the building of miles of wharf for ocean-going vessels.

The public works department has charge of the laying out of new city streets and the widening of old, a work in which Canton is busily engaged at the present time. It directs the construction and repairing of streets, bridges, sewers and conduits. Of the latter there are none as yet, but their construction is a necessity before Canton can become in any real sense a modern city. The regulation of building and the supervision of parks and public buildings are also functions of this department. Building regulation is of greatest importance in burned over areas, as the city insists that these areas shall be rebuilt, not as they were, but in accord with the demands of modern efficiency and sanitation. This means streets as differentiated from narrow alleys and requires endless diplomatic negotiation with heads of families whose personal interest for the moment renders them none too sympathetic toward the new order of things.

The department of public safety controls the police, of whom there are about 4,000, and the fire brigade, of which there are about 100 members! Order is fairly well preserved in Canton and even traffic is much better regulated than in most Chinese cities. The officers direct the traffic instead of being directed by it as in Peking. Fire protection, however, is entirely inadequate. The neagre city fire force is supplemented to some extent by the efforte of volunteer guild and hong companies but the frequent conflagrations are sufficient evidence that this is one of the functions of the municipality which will require early attention. The fires are not only frequent but disastrous. Acres of buildings go down almost every time. It has one compensation. It hastens the widening of the streets and the modernization of the city. But pursued for this end alone, the method is a drastic one. The department of public safety is also authorized to organize a "Citizen's Volunteer Corps," but just what is intended here is not so clear. No attempt has been made in this line as yet. The department is also charged with the suppression of illegal and disorderly businesses.

The department of public health is expected to attend to the cleaning of the streets—no small undertaking in the unrenovated portions of the city. It regulated the markets, slaughter-houses, baths, restaurants, saloons, theaters, and public latrines. It registers births, deaths, and marriages and has charge of the city census, a matter which cannot progress very far, at least in securing the total number of the population, until the boundaries of the city are fixed. Medical practitioners, dryg stores, and hospitals come within its jurisdiction. A foreign diploma is sufficient to permit the holder to practise the healing art. Also those native practitioners who are over 40 years of age and have practiced for ten years are permitted to continue. All others, however, must take an examination based upon a required course of study. As both the course and the examination are determined by a board of the old practitioners, it may be assumed that the number of native practitioners, now about 1,500, will not increase with undue acceleration.

The department of public utilities is charged with the management and regulation of tramways, gas, electricity, and telephone service. Its jurisdiction extends to the regulation of motor-cars, rickshaws, sedan-chair, ferry-boats, etc. Rickshaws in Canton are all owned by large companies. Ten of these companies are operating at present. Each rickshaw is taxed by the city $100 a year. The companies pay this tax and rent the rickshaw to the coolies who in turn must pay a rental of $16.50 a month, or nearly 55 cents a day. One coolie usually works during the day and then sublets the rickshaw to another for the night at 25 or 30 cents. Private motor-cars pay $80 a year and public or rental cars, $100 to $120 according to size.

The department of education includes beside the control of the city schools, the supervision of private schools, the regulation of theatres and other public places of amusement, the promotion and supervision of private charities, and a measure of responsibility for the maintenance of a poor house, a blind school and a leper hospital which are under the immediate management of the Catholic mission. One-fifth of the municipal budget has been appropriated for purposes of education. This amounts, however, to but little over half a million dollars or about two dollars per year for each child of school age. Its significance lies in the fact that it is larger than the amount spent in the entire province until the present *régime*. The municipality maintains 61 schools. There are 41 primary schools, 17 higher primary schools, one commercial school, one agricultural school, and one nurses' training school. The total number of students in the municipal schools is about 7,000, of whom 2,000 are girls. The private schools, however, carry the bulk of the load. There are about 1,000 of these and the attendance is as high as 33,000.

In addition to the regular departments, there is a secretariat of general affairs which is charged with the care of official correspondence and files, the editing of the *Municipal Gazette*, a weekly publication, recording of documents and all matters not assigned to other departments. This work is directly under the supervision of the mayor.

The salaries of the higher officials are fixed by the charter. The mayor receives $500 a month, and each of the commissioners $400. The compensation of all other officers and employees is decided by the municipal executive council.

The most interesting feature of the provisional charter is the provision for a municipal advisory council, which is designed to represent the people of the city as an advisory body to the municipal executive council. It is here that the training of the people in citizenship comes in. The advisory council is composed of thirty members who are divided into three categories. Ten members are appointed for the first year, ten are elected by the people of the city, and ten are chosen by different economic interests as follows: three by the merchant class as represented in the general chamber of commerce, three by the labor class as represented in the labor organizations, one by the teaching profession as represented in the educational association, one by the legal profession as represented in the bar association, one by the medical profession as represented by the medical association, and one by the engineering profession as represented in the engineering association. Elections are to be held annually and each year the number of members elected by the people shall be increased by two and the number appointed by the governor decreased by two. The provision for the representation of economic interests as such is a new departure which may or may not owe its introduction to the dissemination of Soviet doctrines over the world. It is not, however, the result of local Bolshevism, which apparently does not exist. The municipal

advisory council was to have been organized within three months after the promulgation of the charter, but the good citizens of Canton were too apt pupils in the art of municipal elections. The first election was held and immediately contested on the ground of bribery and illegality. After a lengthy trial in the courts, the entire election was declared void and a new one ordered. This has just been completed, apparently with better success, but the council still awaits the appointment of the gubernatorial nominees before it can organize. The powers of the advisory council extend to the submission to the executive council of petitions presented by the citizens, the decision of matters submitted by the executive council, and the examination of the condition of the different departments. In case of disagreement on submitted matters, the final decision rests with the civil governor. The advisory council thus becomes sort of a permanent grand jury with a right to examine and report upon the conduct of the municipal government and each of its departments. The members of the Council receive $500 per year for their services.

The qualifications for municipal electors are as follows: Age of 21 years, domicile in the city of Canton for one year, legitimate occupation, ability to read the charter, good and sound mind, and full possession of civil rights. Elections are held one month before the expiration of the term of the acting members of the council and are supervised by an election commission of five appointed by the civil governor.

As in most governments to-day, the chief problem of the new municipality is that of finance. The sources and amounts of revenue expected by the city are given in the municipal budget as follows:

House rent tax (10 per cent. of annual rent, one-half by each party)	$645,045.00
Sing-song girl license	518,000.00
Theatre licenses	77,700.00
Cinema licenses	12,420.00
Boat licenses	28,956.00
Rubbish disposal	7,200.00
Rickshaw licenses	291,458.00
Market stall rentals	3,583.00
Rent from Taishatou Island	2,170.00
Public lands converted	63,520.00
Provincial government subsidies	240,000.00
Physicians registration fees	5,000.00
Special business registrations	1,270.00
Building permits	3,600.00
Blind singers licenses	1,500.00
Novelties license	500.00
Fines	15,180.00
Confiscations	414.00
Fines from Department of Public Works	960.00
Municipal Gazette	800.00
Municipal Hospital	1,200.00
Recording of title-deeds, etc.	49,000.00
Total	$1,969,997.00

The expenses of the government are tabulated as follows:—

Mayor's Office	$51,192.00
Department of Finance	63,652.00
Department of Public Safety	1,345,042.00
Department of Public Works	538,130.00
Department of Public Health	274,936.00
Department of Public Education	543,670.90
Department of Public Utilities	40,252.80
Municipal Auditing Office	28,392.00
Total	$2,884,249.70

The obvious deficit is $914,252.70. But in order to arrive at a real estimate of the probability of self-support, there must be added to this the provincial subsidies amounting to $240,000 and the land sales amounting to $64,520, thus bringing the deficit up to nearly half the total expenditure. A readjustment of spheres of taxation between the city and provincial governments will be necessary before the municipality can properly adjust its finances.

Meanwhile another long step ahead has been taken in the establishment of a department of audit to audit the accounts of the municipal government and to submit monthly statements, which are to be made public by the executive council. Annual reports are also provided for. Here indeed is a new departure in Chinese governmental affairs. If Canton can actually put into practice the idea that public money must be accounted for to the public she will highly deserve the gratitude of the whole country. The auditor is to be appointed by the civil governor and must be a man of special training in accountancy. His salary is fixed by the charter at $400.

As its title indicates, the present charter is provisional. After it has been in effect for five years, the civil governor *may* appoint a revision committee to draft a new charter and submit it to the provincial assembly for final approval and adoption. The fate of the experiment thus rests entirely in the hands of General Chen Chiung-ming or his successor. By the control which he retains he may make or break the cause of self-government in the capital city of the South. The drafting of a permanent charter which shall vest the control of the government entirely in the hands of the people of the city depends upon his favor. But what he has granted has been granted freely and is earnest of his sincerity. He has followed his action at Canton by granting a charter at Swatow, and now Wuchow, the largest city of Kwangsi, has received a similar document. It is an experiment under auspicious circumstances and will be watched with interest by those who are striving for China's advancement.

American Firms in China

NEARLY 500 concerns established entirely by Americans and American capital are operating in China, says a Washington report. American concerns represent approximately six per cent. of all the foreign firms doing business in the Chinese republic, In 1920 alone more than 400 American concerns opened for business in China. In 1914 there were only 136 American companies here. The growing friendship of Chinese business men for American companies, and their seeming preference for American-made goods is causing concern to the business men and exporters of England, France and Germany, according to records of the department of commerce.

More than 7,000 American business men are devoting their entire time to managing their concerns in China. A far larger number of American manufactures and exports have a direct interest in the republic through a continuous exchange of commodities and raw materials. In addition American financiers are interested through loans made to the government. A large number of Americans hold bonds of the Chinese republic. The exact number is not known, but it is understood to be well into the hundreds.

Cheap Western Labor

ACTING Commercial Attaché Butts, at Tokio, reports that the output of pottery has fallen off about 30 per cent. in Nagoya and the industry remains in a depressed state. The glass industry is in even worse condition, several of the larger plants having practically shut down. The trouble seems to be inability to compete with cheap Occidental labor.

Get that last sentence. Japanese industries are shutting down because of inability to compete with "cheap Occidental labor." Japan is a part of the Orient, of course, and the Occident is always complaining about the cheap labor of the Orient. And here is the Orient complaining about the cheap labor of the Occident. Like as not the first thing we know the people of Japan and China will be asking a tariff against our cheaply produced American goods.—*Joplin Globe.*

The Railway Concession in China

(Contributed)

TO China the word "concession" has always been "anathema," recalling the great humiliation of 1895, when Japan exposed to the Western powers, China's true value as a military power.

The Chinese Eastern Railway concession was the offset for Russian aid, which secured the retrocession of the Liao Tung Peninsula on the termination of the Japanese war. The Yunnan Railway was the French reward for friendly and traditional co-operation with Russia for the same ends, while the Shantung Railway was a purely commercial transaction, drawn on lines quite usual elsewhere, with the vital omission that China did not receive the usual monetary compensation. This feature characterized all three concessions, though in the case of the Chinese Eastern Railway there was mention of a payment of 5 million taels, a condition tacitly ignored until the present year (1920) when China again assumed a degree of control over the railway.

The conditions of all these concessions were curiously vague and the reverse of what are usually considered vital conditions. Generally, the concessions give the impression of a half learnt lesson in Western cunning or divided counsels on the question of confidence in European advice. Thus the Chinese Eastern Railway agreement gave Russia exclusive mining and development rights over a zone bordering the railway whose extent is left undefined. It is definite enough on the 36-year clause after the lapse of which China might purchase and also on the question of cession to China free of cost after the lapse of 80 years. Again in the Yunnan Railway, the French have neither police nor mining rights, but there is a vagueness over the questions of cession or purchase, an omission probable accounted for, by the fact that Yunnan is a far cry from Peking and the natural obstacles enormous for railway construction which would make the extension of this line a menace to regions were Chinese rule was worth maintenance. The absence of police and mineral rights is also perhaps an indication of the appreciation of the secondary role played by France in the Russo-French combination. Further in the case of the Shantung Railway though mineral rights for a distance of 10 miles on either side of the line were ceded, and Germany acquired exclusive rights for the creation of a railway system for Shantung, China merely reserved the rights of purchase at some unspecified date. A feature of all the agreements was the insertion of a clause stipulating that work was to begin within six months of signature. This clause was more honored in the breach than the observance, as China was in no position to insist on its compliance.

As a whole, "force majeure," was too evident in the initial stages of all three concessions, but only in the case of the Chinese Eastern did this state of things persist. In Manchuria, Russia pushed through her great scheme at a speed which only the presence of foot, horse and guns continually at hand could have secured. In five years, the Chinese Eastern Railway and its branch to Port Arthur (over 1,500 miles) was virtually a *fait accompli* and Manchuria, a Russian dependency as regards the railway zone; But Russia spent money in the country in prodigal fashion, provided employment for thousands and golden opportunities for the exercise of the trade genius of the Chinese. Also to a certain limited extent, though the commercial aspect of the scheme was obscured by the strategic, the country benefited from the provision of railway transport, and the consequent opening up of new or more distant markets for the products of an extremely rich province. These benefits would never have been so quickly secured under a dilatory and ultraconservative empire, which, though harried and cajoled by Li Hung-chang with a persistance and energy which always characterized him, took 16 years to complete 262 miles of the Peking-Mukden Railway.

In the case of the Shantung Railway, a thoroughly business atmosphere characterized its outward operation, but there was always the garrison of Tsingtau in threatening proximity. Another feature was a thorough and exclusive protection of German trade interests which stifled all attempts at foreign competition. Germany however loyally abided by her undertaking not to transport troops out of the Tsingtau zone unless the situation got beyond the control of the local authorities, and even went so far as to assure the United States in 1902 that she considered her rights in Shantung as in no sense constituting a monopoly. Unquestionably the creation of these two railways and above all, the ports of outlet, Dalny and Tsingtau, enriched China's revenue earning capacity. The material welfare of the people in the railway zone was advanced. Dignity was doubtless offended, but a dignity which relies for support on the traditions of a splendid past is bound to suffer in contact with those for whom the past has no appeal. Perhaps the denial of the right to obstruct was the greatest wound to Chinese pride.

As for the French concession of the Yunnan Railway, construction was delayed till 1904 and when put in hand, proved enormously costly both in lives and money—a tax on a new colony out of all proportion to the benefits conferred and a staggering financial burden added to the generally unproductive French colonial empire.

Thus, as a result of great expenditure, France established a sphere of influence, which may have a great future but only as the result of further colossal financial effort. France further exercises control over a railway which is a perpetual tax on colonial revenues, while China benefits by increased accessibility to a hitherto secluded and isolated province, and further, to the extent of customs revenues, which, but for the railway, would never have been feasible of collection.

Without doubt, the settlement of Russo-Japanese differences in 1904 on Chinese territory was a highly reprehensible proceeding, but here again some localities are fated for these decisions, for just as Belgium is the battlefield of Europe so was Manchuria fore-ordained as the place of impact for Russia and Japan. The railway merely localized the fighting and devastation and probably hastened the end, and who is to deny that Chinese sutlers and camp followers reaped a golden harvest during hostilities. Again China profited by the Japanese victory in the substitution for Russian muddle, drift and corruption, of a Japanese administration over the southern 500 miles of the Chinese Eastern Railway (from Dalny to Changchun). This administration has been remarkable for its efficiency and its vast development schemes in which the Manchurian population share, to a very considerable extent.

Then, without a doubt, considerations of sentiment aside, China's concession railways have not served her badly. Materially, they must have all assisted her and China now exerts a divided control with the Russian shareholders of the Chinese Eastern Railway, a control which the powers will without question preserve.

It will not be denied that China suffered moral wrong in being coerced into modernization, but ethics have no influence with peoples with the calls of empire to satisfy and the wherewithal that brooks no opposition. China should be thankful that she was never called upon to guarantee a purely strategic and unproductive railway as Persia was by Russia in 1912, and that she has never groaned under the burden of a kilometric guarantee.

This form of guarantee, under whatever conditions, is the sort of gilt edged ultra-profitable security which all railway concessionaires dream of, but fortunately for the exploited, few obtain. Briefly, this form of guarantee ensures a perpetual dividend without the effort to earn one; there is no inducement to develop traffic, the line must be maintained to carry a specified number of daily trains for which the rolling stock may be adequate or the reverse; in short, everything in the agreement is carried out to the letter and nothing further. This pernicious system is a feature of some of the Macedonian Railway agreements, and of some of the French concessions in Syria, but the Bagdad Railway and the Anatolian system from which it originated, are the most fantastic examples of outrage on intelligence and contemptuous exploitation which reveal the rottenness of Turkish officialdom and German moral turpitude.

This concession was the outcome of the Kaiser's second visit to Constantinople. Its salient features were as follows: The

company was Turkish but the perpetual predominance of German control in this company was amply secured. The concession was for 99 years and the terms of cession to the Turkish government absolutely prohibitive. Construction at any time could be indefinitely delayed. For each 200 kilometre section the Turkish government was called upon to guarantee bonds to the amount of 54 million Francs, irrespective of the character of the work. The working of this clause is well illustrated in the construction of the first 200 kilometre section between Konia and Eregli. The loan for 54 million francs was duly floated and realized £1,868,000 or £14,944 per mile. The actual cost of the 125 miles (200 kilometres) cannot have exceeded at most £5,000 per mile, or a total of £625,-000, so that the company pocketed £1,243,000 and realized a profit of 400 per cent. This section was completed in 1904 and there is no construction difficulty east of this until the Taurus Mountain Section (built during the war) is reached. Consequently, even if the company were compelled to disgorge for this most costly bit of work it was not until they had had the use of this money, and any added profits, for over 15 years. Even then, it is a question whether this section was not constructed by combined Austrian and German governmental agency. Further, for working expenses of the line, the Turkish government agreed to a guarantee of 4,500 francs per kilometre and as the Bagdad Railway Company handed over each section to the Anotalian Railways to operate when completed and paid them at the rate of 3,700 francs per kilometre, the company again made a certain and unearned profit on operation.

The holders of the Turkish government bonds sold for the construction of the line, had no voice in the management which was entirely vested in the company, whose capital was only 15 million francs half piad up. Turkish capital liability for each section could not exceed the above 54,000,000 francs—a tempering of the wind to a lamb already very much over shorn—; for in addition to the burden of the Bagdad Railway, Turkey had agreed to a kilometric guarantee of 15,000 francs per kilometre on the 587 kilometres of the German-built and controlled Anotalian Railways. It is calculated that the kilometric guarantee cost the Turkish taxpayer £9,000,000 between the years 1889 and 1907.

All told, the German railway ventures in Asia Minor must have given satisfaction to the Kaiser, who was, in the main, responsible for them. Germany became paramount at Constantinople and with consummate cleverness retained her supremacy through the revolution of 1908 and the débâcle of 1912. Turkey has the empty satisfaction that if her money went to enrich the German concessionaire it was returned many times over in order to equip her in a fight against her old time ally Great Britain, who, but for the Russian bogey in India and pre-occupation in Egypt, might have elected to defend her interests in Asia minor and saved Turkey from herself.

Turkey's railway history shows the darkest side of the concession question and is the exception which proves the rule. If we turn to South America a very different state of things prevails. The prosperity of the greater South American republics is undoubtedly due to the wholehearted adoption of the concession principle, particularly as applied to railways, docks and harbors. Isolation and the Monroe doctrine, forbade the use of concessions as weapons for empire builders. The concession became in South America a hum-drum business proposition, with no political furture before it, no nucleus for magnificent and megalomniac dreams, divorced entirely from romance unless local revolution is considered, and this could only end in the bathos of distraint for damage sustained. Thanks to the United States, South America will never witness "a battle of concessions" or be the victim of "conquest by railway and bank" and will never undergo that sure process of strangulation which follows the creation of a sphere of influence which begins with protestations of goodwill and ends, in some cases, with the organized regrettable incident, which is the prelude to "protectorate and national death."

South American history since the beginning of this century is a record of progress extraordinary. The greater republics have learnt the futility of revolution and grasped the fact that governmental stability ensures the flow of foreign capital necessary for the country's development. Thus, it is estimated that the investments of Great Britain alone in Latin America are in the neighborhood of $4,000 (gold) million, while Germany, France and Belgium have put another $1,000 million into the country.

The bulk of British money is sunk in railways, docks and harbors, which have been financed of concession lines and are the absolute property of the concessionaires. In the Argentine alone, British money to the extent of $1,000 million dollars has been invested in concession railways. Here the concession principle is so general that in 1909 what is known as the Mitre Law was introduced for the future regulation of railway concessions. Previous to this each railway controlled the terms of its own concessions but from this date onwards all concession railways are exempt from all national, provincial and municipal taxation and import duties on material until the year 1947. The railways pay to the government a single tax of 3 per cent. on the nett earnings, the amount of such earnings to be ascertained by deducting 10 per cent. from the gross receipts. The result of the use of the concession principle has been that the Argentine has been provided with a railway system, of 21,000 miles built and maintained to first-class standards and adequate to develop the land which the natives have been, and are now doubly so, careful to keep in their own hands. The trade of the Argentine between the years 1904 and 1913 increased 108 per cent. and was valued at over $996 millions in the latter year. The credit of the country is now exceptionally good whereas in 1890, the dawn of the era of regeneration, and the date of the last revolution, she was practically bankrupt, beggared by unparalleled corruption and internecine strife. Could there be a stronger testimonial for the concession principle, for the railways made the prosperity of the country and owe their origin to it. The Argentine is no exception either, Chile, Uruguay, Brazil, have all made the fullest, freest use of the nations with money to lend, to their unquestioned lasting benefit.

To turn elsewhere in the world, even Portugal has been driven to the granting of concessions for the development of her burdensome African colonies. This was not done without a wrench, for Portugal is very jealous of the safety of these links with past greatness. Besides, the colonies provide a host of sinecure appointments for the official classes and as this class more and more tends to become the bulk of the population, their retention at all costs becomes a necessary undertaking of the rapidly changing governments. Where unfertilized by capital these outposts of Portuguese Empire are a uniformly barren and melancholy spectacle. The Portuguese is no pioneer, he clings to the stifling coast towns. These towns in every sense are moribund,. dying under the influence of climate. This state of things will persist until the absurd tariff laws are repealed (absurd inasmuch as Portugal is not a manufacturing nation) and foreign capital encouraged to the utmost, instead of, as in China, being given a grudging suspect and obstructed admittance.

If then China is reluctant to do business with the consortium, she would do well to revise her decision with regard to concessions. China would profit exceedingly could she rid herself of the tendency to be swayed by canards and catch words. This is an unfortunate Chinese trait, due to an age old system of education, which tends to develop memory more than reasoning faculty. Moral saws proverbs and catch words thus acquire undue importance and exact unreasoning obedience. This is why "concession" has become a synonym for disruption and national destruction and explains the limited success of the interested and instigated campaign against the consortium in which the slogan has been "sovereignty and monopoly."

At all costs China must have foreign capital. There is room enough for the consortium and the concession system of raising it, but a preliminary must be the adoption of a more trusting attitude and realization that the country is no Eldorado which the nations of the earth will scramble to finance.

Development of Rolling Stock on N.E.I. Railways

(Compiled by the N.E.I. State Railway and Tramway Office)

IN the December number of THE FAR EASTERN REVIEW we described the development of the locomotive rolling stock on the Netherlands East Indies Railways. The history of the development of the freight and passenger rolling stock may be briefly sketched as follows :

Until the year 1894, nothing but *two-axled* trucks or cars were in service. In 1895 the first *four-axled* box cars came into use. Since then, trucks having a fixed wheel-base of 1.50 M. have been imported for high open goods-wagons and flat cars, as well as for the type already mentioned above. In 1904 the allowable load of the two-axled wagons was increased from 8 to 10 tons, which could only be done after the old axles with thickness in the hub of 100 mm. and a journal's diameter of 80 mm. had been exchanged for new ones with 116 mm. thickness in the hub and journals with 90 mm. diameter.

During the war, when no new rolling stock was coming out, the scarcity of cars was so great that it became urgent, by way of temporary measure, to increase the allowable load of the two-axled cars from 10 to 12 tons, and that of the four-axled ones from 20 to 24 tons. Meanwhile axles of 125 mm. hub-bore were already, and for that matter, still are, being ordered, so that by degrees the replacing of the thinner axles by thicker ones will render the temporary measure a permanent character.

The following are special cars :—

No. 1, see page 108, is a six-axled well wagon running on 2 three-axled trucks, designed for the transport of heavy, bulky engine parts, total length of frame 18.70 m.; available length of the well ad 10 m.; carrying capacity 30 tons.

Furthermore a steam wrecking-crane on 6 axles weighing in working order about 60 tons with a greatest capacity for lifting 15 tons at a swing of 9.15 m., and a lifting-speed for the same load of 7 m. per minute.

Moreover there are 35 "breakdown" vans placed at various stations ; these are box cars provided with complete inventories, which contain various toots and implements for clearing away impediments and wrecks.

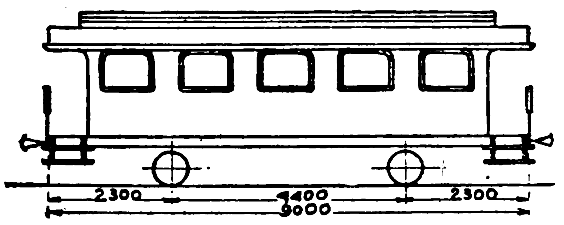
If it was possible to manage for a long time with 2-axles and a fixed wheel-base of 3 metres for the cars, with the passenger-coaches the need of longer vehicles was very soon felt ; longer than would be possible with the 3 metres fixed wheel-base imposed by the mountain-lines with their minimum radii of 150 metres. This gave rise in 1881 to the importation of the first series of coaches carried on 3 what are called Cleminson trucks. By this system the three axles are placed in such a manner in frames coupled to each other, that the two outermost axles adjust themselves to the curves, whilst the middle axle has lateral play. With the increase of the speeds, however, these coaches proved to be unsuitable, also because they were too lightly constructed, and it was found necessary to use, by preference, bogie-carriages also for the sake of steady running. We find in the Kiebitz under frame and effort to render a longer wheel-base possible for mountain-lines whilst retaining two axles ; this design comprises two one-axled trucks.

On account of their insufficient strength these Kiebitz frames are gradually couverted into and superseded by frames with flexible axles (Lenkachsen).

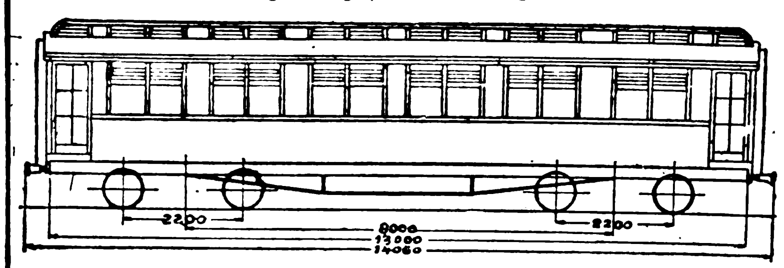
The first coach on two-axled bogies was the saloon coach of H.E. the governor-general, which was put into service in 1891 (now out of date and converted).

It was not until 1895 that a beginning was made with the regular building of coaches and luggage-vans mostly measuring a length of 13 m. and placed on two two-axled bogies. There are now various bogie systems in use, namely simple ones without a cradle, trucks with a "swan neck" equalizer, trucks with cradle hangers inside the frame-plates according to American and European practice (this system is gradually being superseded by that one with the cradle hanger placed outside the frame-plates) and trucks having the cradle-hangers and cradle-springs placed outside the

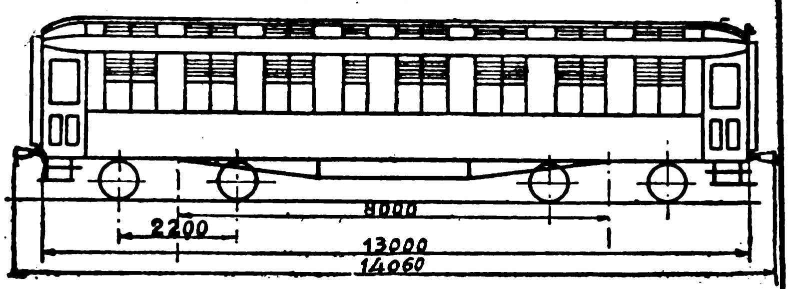
1st and 2nd cl. Passenger Carriage (AB) 9 Meter long.



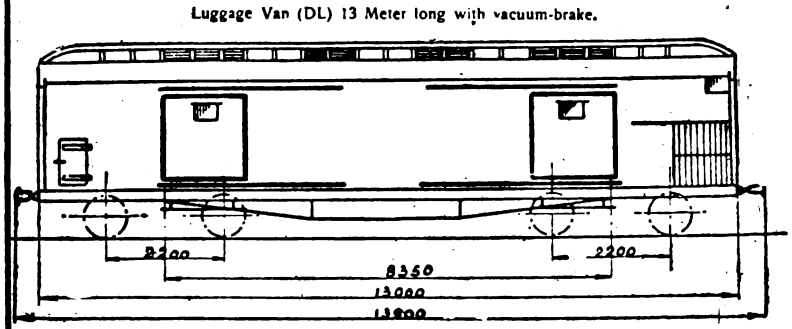
1st. and 2nd. Passenger Carriage-(ABL) 13 Meter long with vacuum-brake.



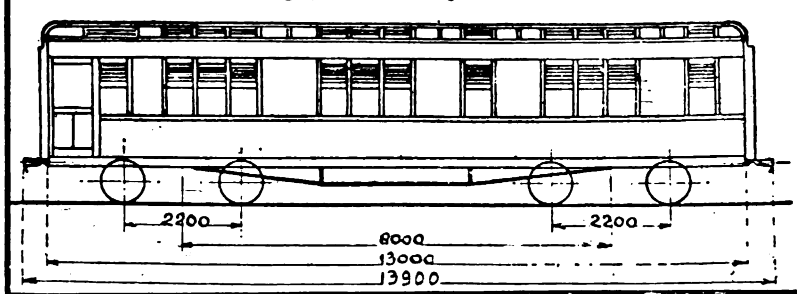
3d. cl. Passenger Carriage (CL) 13 Meter long with vacuum-brake.



Luggage Van (DL) 13 Meter long with vacuum-brake.



Hospital Carriage (EL) 13 Meter long with vacuum-brake.

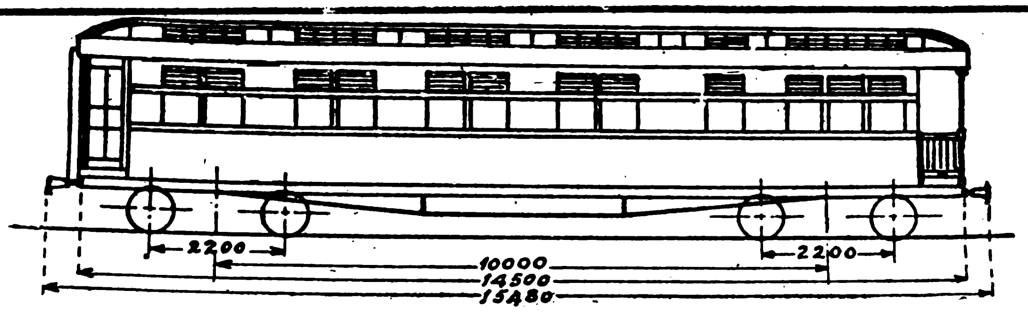


frame-plates. Experience has taught that copying the American cradle-trucks for adoptation on a 1067 mm. gauge, has not led to the favorable results which were expected, not even when the hanger-pins were replaced by knive-edges. It was only in 1908, when the hangers and cradle-springs were placed outside the frames, that a type of coach-truck was obtained which ran steadily even at the highest speed (100 k.m. an hour). Since then, this principle, which has given such excellent results, has been applied to all the new coaches (also to those measuring 18.5 m.)

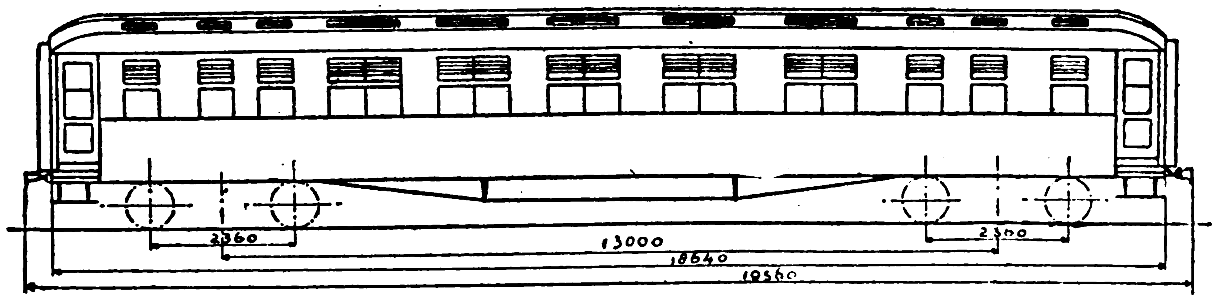
Also in order to increase the easy running of the coaches and to prevent any tiresome "rocking" movement, the old wheel-bases of the cradle-trucks have been increased from 1.50 m. to 2.20 m., which latter measure now holds good for all 13 metre bogie-carriages and luggage-vans with distance of 8 metres between the pivots. In the case of the 18.5 metre coaches, the wheel-base of the trucks and the distance between the pivots, are 2.360 and 13 metres respectively. It proved impossible to make them larger.

Experiments, begun in 1910, with a new profile for wheel-tyres proved, that the running of carriages was ably improved by rendering the side play between flange and rail-head smaller for the straight stretches by a moderate taper and still more by the profile of the flanges throat.

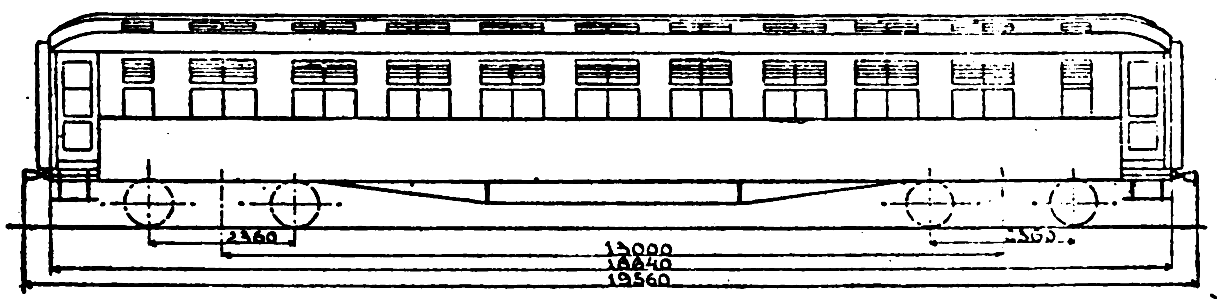
In consequence of this, the new tyre profile is gradually being introduced in accordance with which the flange is made thicker, the taper of the tread has been altered from 1/20 to 1/40, the outer taper from 1/10 to 1/8 whilst the former



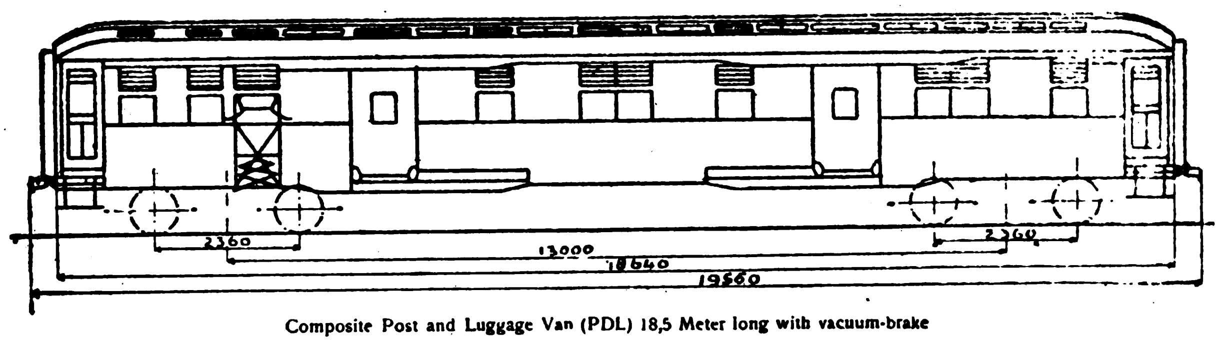
1st. and 2nd. cl. Passenger Carriage (ABL) 18,5 Meter long with vacuum-brake.



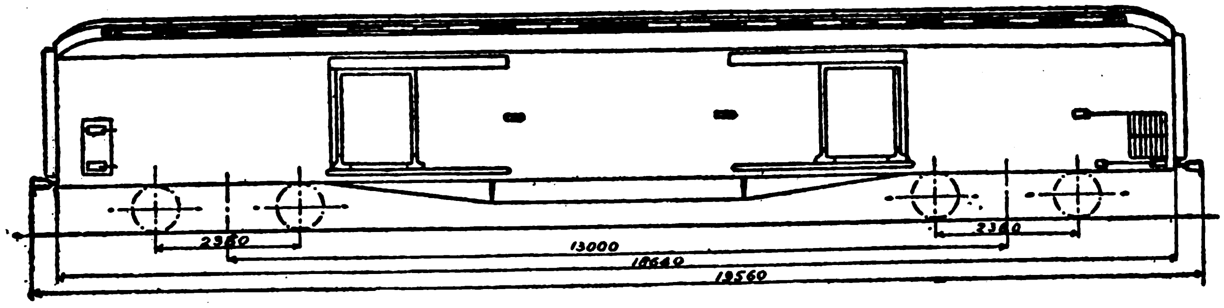
3d. cl. Passenger Carriage (CL) 18,5 Meter long with vacuum-brake.



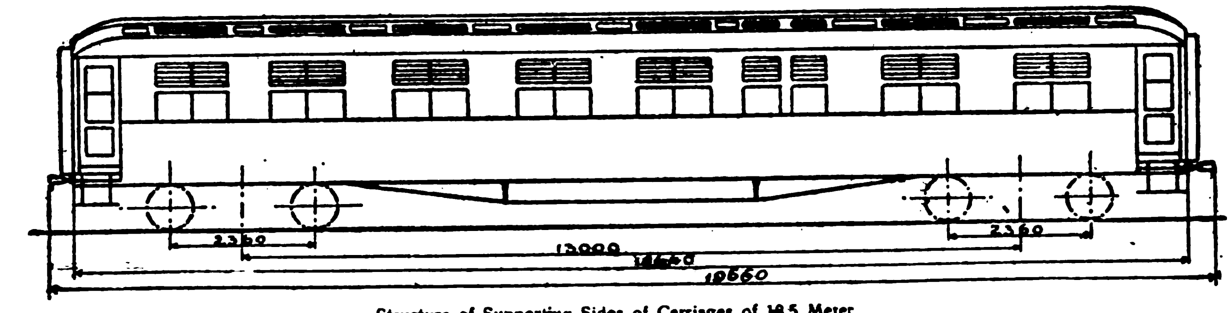
Post-Office Van (Post L) 18,5 Meter long with vacuum-brake.



Composite Post and Luggage Van (PDL) 18,5 Meter long with vacuum-brake



Restaurant Car (FL) 18,5 Meter long with vacuum-brake.

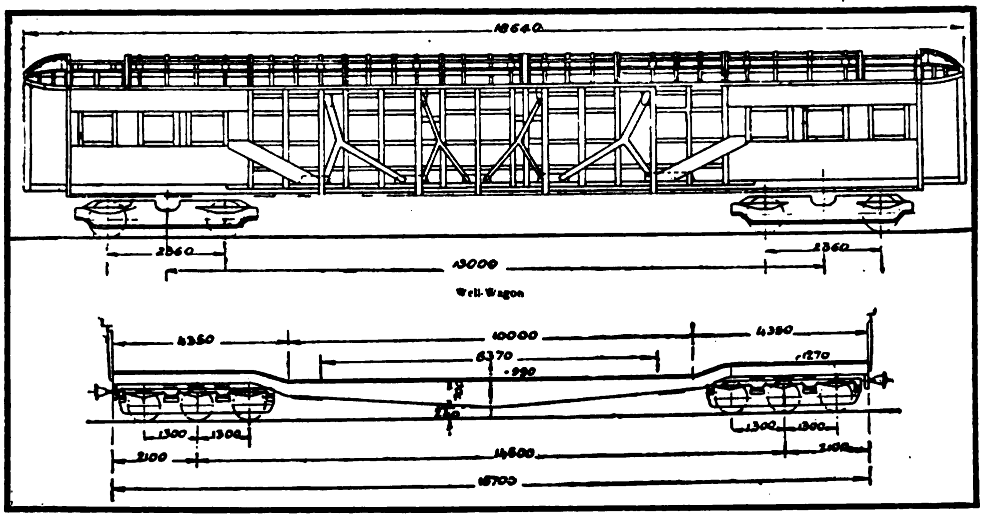


Structure of Supporting Sides of Carriages of 18,5 Meter.

flange throat radius which had been 11 mm., has been altered into one with a radius of 30 mm. merging into a 15 mm. one.

The intention at present is, to apply flexible axles (Lenkachsen) wherever the wheel-base exceeds 3 metres on account of the curves of 150 m. minimum radius, so that in future no other system will be met with in the case of two-axled carriages.

In addition to the coaches of 13 m. in length and to improve the riding qualities when running in other ones have been the express-trains with maximum-speeds of 100 k.m. an hour constructed with a length of 18.50 m., without a separate under-structure, but with weight-carrying side walls constructed like bridge-girders. This construction is chiefly executed in iron and is stronger than those of under frames which separate wooden bodies. Where as the coverings are of wood, it is possible to combine the advantages of strength (iron frame) with coolness (wooden coverings). The increase of the length aimed also at the reduction of the specific resistance especially the air resistance per ton tareweight as compared with the present 13 m. cradle-truck carriages. To prevent rocking, a strong coupling apparatus has been applied with two sidebuffers and an automatic, central coupling hook.



Express Train Coach and Well Wagon

The 18.5 m. AB coaches can seat 24 second class and 14 first-class passengers (as contrasted with 18 and 8 respectively in the 13 m. coaches) ; the 18.5 m. C—coaches with transverse seats, can accommodate 72 passengers (as contrasted with 55 in the 13 m. coaches).

The 18.5 m. dining cars can accommodate 26 persons, at 10 single and 8 double or "family" tables, as they are called (as contrasted with 14 in the 14.5 m. cars). The 18.5 m. luggage-vans will have a capacity of about 12 tons (whereas the 13 m. vans could only take 6 tons).

The design of 18.5 m. long postal-vans and postal luggage-vans, is at present under consideration.

The walls of these cars are rendered to enable it to carry weight by the application of a sort of iron trusses between the roof-beams and the floor. In addition to this the ends of the sides are fitted with armoring plates also with the intention of lessening the danger of telescoping in case of collisions.

It is easily understood that for these coaches and cars, heavier bearing and cradle-springs and also heavier axles and wheels had to be designed. These have a hub bore of 150 mm. and a journal with a diameter of 115 mm. and a length of journal of 200 mm. (as contrasted with 154 mm. journals length in the case of the ordinary axles of 90 mm. journal's diameter). It is worthy of note, that a width has been attained in these coaches which only differs from that of the large European corridor-coaches by about 20 cm., whilst the difference in gauge consists of 143.5—106.7=36.8 cm.

The type of carriage with a central passage which is used in the East Indies, as well as in America, is retained on account of its advantages for the tropics outweigh the disadvantages. They are cooler and roomier for seating the passengers, although the hindrance of the passing to and fro is not in their favor.

A word may be said here as to the interior finish of the present-day carriages. Already with the last number of 13 M.A.B. carriages the assistance of a specialist for interior panelling and outfitting was called for.

The design for the interior decoration of the latest 18.5 m. dining cars was drawn by the well-known Dutch artist, Willem Penaat.

The interior displays a simple yet pure design of the main lines together with a very correct and able application of color of the materials, a mastery of color which took care of even the smallest details.

The car is divided into front and rear platform dining saloon, kichen, pantry and w.c. When the main lines and form details were designed special attention was paid to the construction of the car, and the decorative architecture is of such a nature that the large panels are fixed by means of borders, straight onto the frame of the car.

In division of the panels, care has also been taken to connect the side-walls and the partition-walls in a satisfactory manner, so that a well-finished whole is the result.

The ceiling is divided into square panels, indicating as a matter of course the pace of the ventilators and windows. Open-work panels of an oblong shape are introduced for the sake of ventilation, into the sky-light, and these with the fretwork above the windows give a certain effect of lightness as contrasted with the otherwise for all character of the decoration of the car. The difference between the dark teakwood work and the sky-light, which is carried out in light-colored Swiss maple and birch triplex, is softened by means of three horizontal bands of teakwood.

For further particulars, see the article in the "Groene Amsterdammer" of 30.8.19 by Otto van Tusschenbroek.

Further special carriages are the following ones :—Two saloon-coaches for H.E. the governor-general, which were built at the main workshops at Bandoeng, having under frames 18.5 metres long one of which is destined for use on long journeys possessing two sleeping-apartments, a bathroom, and a sitting-room for four people as well as a saloon ; and the other one designed for short journeys, without sleeping-apartments, but with a bathroom, two sitting-rooms for four people and a saloon. Both are fitted with electric light, on the Brown Boveri system, and with electric fans.

Furthermore there are too ambulance-cars with 13 m. frames designed to run in express-trains at a speed of 100 k.m. an hour, and in case of need are also suitable for the most transportation of wounded, as they are fitted with 12 stretchers, a medicine store, an operating-table, a compartment for six attendants, electric light (Boveri Brown system) and electric fans.

Moreover we find 35 Red cross vans on 2 flexible axles (Lenkachsen) distributed amongst various stations. Each van is equipped with 16 stretchers and supplies of first-aid material for the transport of wounded in case of accidents and in time of war.

Finally there are 13 postal carriages, on cradle-trucks on 11 m. long uuder frames. These carriages were originally fitted out with electric light which afterwards was replaced by aceton-lighting.

For registering ad collecting various data about tractive power capacity specific resistances of engines and various classes of carriages, and specific brake resistances the construction of a so-called dynamometer bogie-carriage is being considered so as to enable the future designer of rolling-stock to make a fruitful use of these data

and to introduce improvements to of the designs. This dynamometer van which will also be very useful for drawing-up rational load schemes, will be built by the firm of Beynes at Haarlem, whilst the various registering instruments will be supplied by the well-known firm of "Amsler Bros." of Schaffhausen. In the main this carriage will be a copy of the dynamometer van used by the Swiss State Railways, a detailed description of which was published in the *Schweizerische Bauzeitung* (Swiss Building Journal), 1914, Vol. 64, Nos. 4, 5 and 6.

The development of the draft and buffing gear has kept equal pace with that of the maximum train loads to be transported.

As a peculiarity it may be mentioned here, that originally the rolling stock was fitted up with a central coupler system Pikl, such as is said to have been first introduced on the Norwegian railway in Europe.

Since it has been frequently applied to rolling stock built in England. From this the present draft and buffing gear has been developed.

In 1878, however, in defiance of Indian advice an effort was made to introduce the European two buffercentral-hook system, but at once voices were raised in Java against a further application of it after its small practical utility and the dangers connected with its manipulation had become apparent.

Carriages, fitted with this system of coupling, were immediately altered and fitted with the Pikl system with automatic central coupling without side buffers. For many years buffer shafts of 41 mm. diameter in the stern coupling pins of 36 mm. diameter, and 5-ton volute springs have been considered quite sufficient.

In 1909 the 7-ton buffer springs and couple pins of 55 mm. diameter came into use whilst as early as 1916 the 12-ton volute springs with fortified buffer shafts of 2 diameter and coupling pins of 55 mm. diameter were applied in large numbers.

As regards the buffer spring in connection with the existing. other dimensions the utmost attainable dimensions have been reached. Should it be deemed necessary at any time to make the buffers, coupling chains, etc., heavier an entirely different model will most probably have to be designed.

As was already mentioned formerly coaches destined for a maximum speed of 100 k.m. hour have been fitted with a central automatic draw hook and two side buffers. The idea was, to combine the advantages of the existing Indian automatic coupling system with those of the system in use in Europe (with side buffers but without automatic coupling of the Norwegian hooks).

On account of the great speeds at which the Java express trains will have to run special attention was paid to the trucks and to the brake gear.

The newly designed trucks unlike those built with pressed steel frames should be strong (and stiff showing little elasticity. For this purpose they are stiffened) diagonally and by large corner plates. The broad pedestals are 48 mm. thick whilst those of 13 m. coaches and vans are only 16 mm.

Moreover these carriages and luggage-vans are fitted with vacuum quick-acting-brake-valves of the Austrian type A. T. and emergency-valves of 1 inch diameter.

When the goods trains became not only heavier but also longer, the difficulties connected with excessive lengths became apparent, with the result that by way of experiment the hand brake system was replaced by the vacuum brake on special goods trains chiefly for long-distance traffic. Although a series of cars were fitted with a vacuum brake for that purpose and although the authorities intended also to make use of the vacuum quick-acting-brake-valves of the Austrian type "K," up to the present moment no further steps have been taken to make the application general. Of the two types of automatic slack adjusters under trial (with rack and sector gear) the one with the sector seems to be better filling the requirements.

With regard to the lighting of carriages progress has also been made. A distinct step forward was taken when the original candles were replaced by paraffin lamps.

In 1910 the Aceton illumination was introduced whilst since 1917 several carriages have been fitted with electric light installations of the Brown Boveri system (with fine self-regulating two-position roller for maintaining an even voltage and for regulating the supply of current when eventually the accumulators are cut out). Some others are fitted with installations of the Stone system (of a simpler construction than the other one but with twice as many accumulators not regulating itself so precisely and much more sensitive to accumulators defects).

Electric lighting has the advantage over gas and paraffin lighting of causing no danger by fire in case of accidents, moreover the electric energy can be utilized for driving fans, which contribute considerably to the comfort of the passengers in the tropics. The intention has been to light express trains electrically, fast and slow trains partly electrically and partly with aceton, and the other trains with paraffin lamps placed in the ceiling.

All 18.5 m. coaches will be lighted electrically.

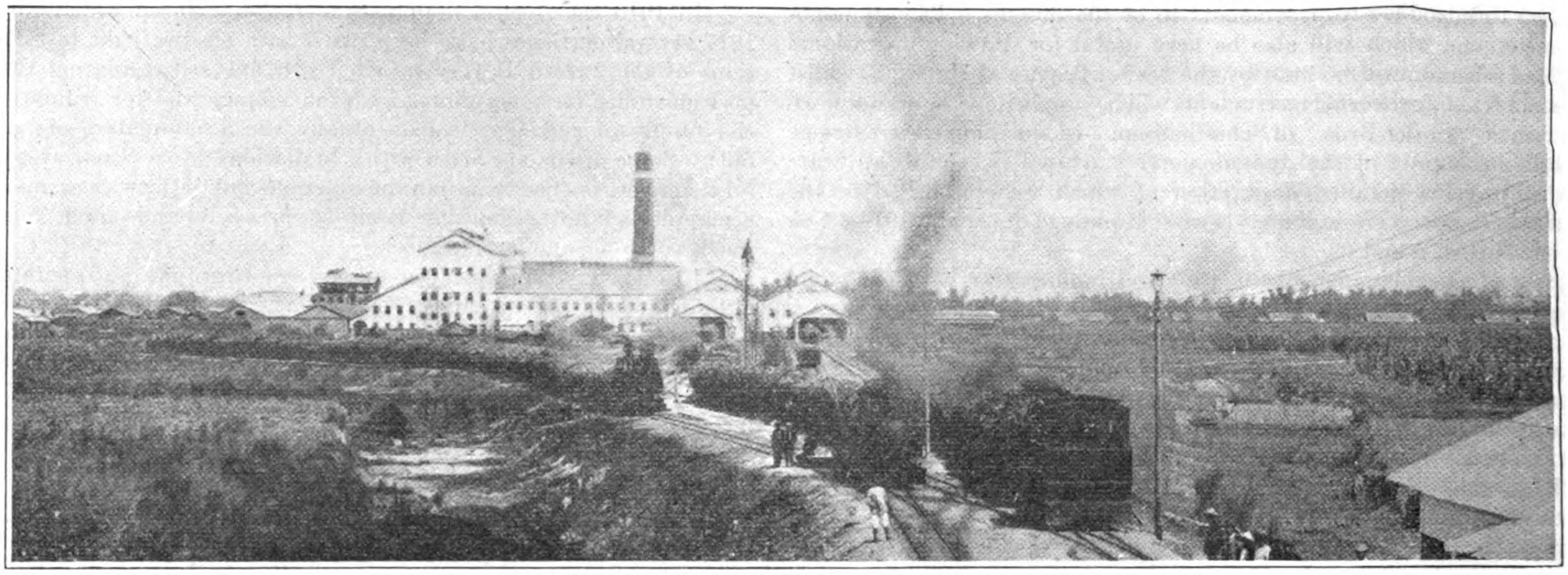
Tin Mining at Kotchiu

AT a recent meeting in London of the institute of marine engineers a paper by Mr. Wm. Semple on this subject was, in the author's absence, read by Mr. J. Adamson, secretary of the institute.

The mining village of Kotchiu, which Mr. Semple visited on behalf of Messrs. Shewan, Tomes & Co., lies in the south-west corner of the province of Yunnan, about 800 miles distant from Hongkong. Tin mining probably started there about 400 years ago. All the mines are situated on the tops of high mountains or in the gulches between them. Alluvial mining was carried on extensively in the earlier years, the ore being plentiful and easy to get at. It is said by some of the old miners that when mining was first started it was to obtain silver, and during prospecting the great tin ore beds were discovered. The abundance of tin ore in the district is really remarkable. Although alluvial mining was carried on extensively, the miners opened tunnels in order to search for a finer grade ore, and some of these extend into the mountains from 2,000 to 4,000-ft., from 3,000 to 10,000 men being employed. The largest mining firm is the Yunnan Tin Trading Company, who are at present installing large pumping plant in order to enable them to work the whole year round, and supply sufficient water for ground sluicing at their open mines at Malaga Hill. The tunnels going into the mountains are not more than 4-ft. square, and descend at an angle of 45 deg., and are very poorly ventilated. The miners are all small men, and their average age is from 12 to 25 years, while, owing to the bad living conditions, the mortality among them is very high.

The ore is principally earth ore, and, after extraction, it is crushed by native methods, either by hardwood clubs or a stone crusher driven by large water-buffaloes ; then it is all hand washed, the ore receiving about 40 washings before it is smelted. The native furnaces are very interesting—they are built with mud bricks and have a little over a ton capacity. The air blower is native made ; the barrel consists of a large piece of timber hollowed out and fitted with a piston, the air-suction valves being of buffalo hide and the air discharge going direct into the bottom of the furnace ; the whole apparatus is worked by manual labor, and it takes from eight to ten hours to make a cast. The smelted tin is run into sand moulds, the amount of metal obtained running from 92 to 99 per cent.

The Yunnan Tin Trading Co. have a large and up-to-date smelting and concentrating plant, which was built by the Germans about ten years ago, and run by their own men. On the outbreak of war the Chinese took it over, but have never used it until quite recently, when they put it under an American administration. When working fully it will handle 1,000 tons of ore a day. The chief trouble is in the refining of the tin, due to the high percentage of lead and arsenic. Formerly it used to be shipped to Hongkong, and re-melted and refined before being put on the market. An American mining engineer as well as a smelting specialist have been engaged to bring the tin up to the required standards.



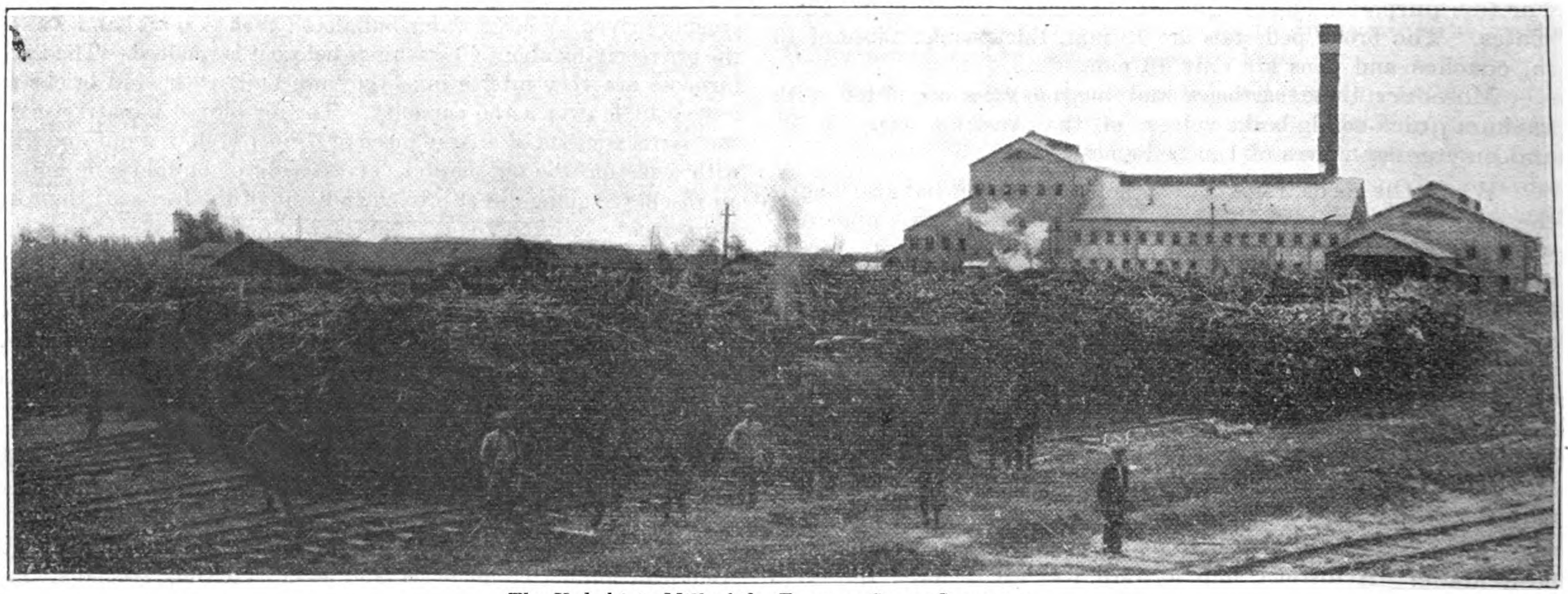
The Great Ako Mill of the Formosa Sugar Company

The Formosan Sugar Industry

UNDER Chinese rule, the island of Formosa produced 60,000 to 80,000 tons of brown sugar per annum, of which, 45,000 to 50,000 tons were exported. The value of this product was about Y.4 per picul or $35 (gold) per ton, on which the Chinese government levied a duty of about $1.50 per ton.

The modern sugar industry in Formosa dates from the year that the island came under the rule of Japan as a result of the war with China in 1895. It was not however until 1902 that the Japanese government began to interest itself in the development of the sugar industry, when active steps were taken for its encouragement through the establishment of an official sugar bureau and the enforcement of stringent regulations. Erection of the old buffalo type of mill was prohibited and the installation of modern machinery made compulsory. Such radical measures of reform naturally provoked criticism and opposition from the owners of native factories, but they soon perceived that their real interests laid in adopting modern methods. Injustice sometimes crept in as the result of the government's policy to hasten the development of the industry by encouraging the formation of big companies to undertake the growing of cane on a large scale, but on the other hand, the policy was broad and liberal, especially in the matter of subsidies and assistance in various forms not only in planting but for the erection of mills. The liberality of the sugar bureau may be judged from the fact that in several instances mills obtained a subsidy of six per cent. on the paid up capital for a period of five years or assistance in the shape of a lump sum of twenty per cent. on the total value of the plant. Notwithstanding these liberal inducements to progress, the Chinese farmers (noted as being more conservative and backward than their compatriots on the mainland) refused to co-operate, compelling the government to take drastic measures to ensure the success of its experiment. In 1905, therefore, special regulations for the control of sugar mills along the lines of a law then in force in the Dutch East Indies, were placed in operation.

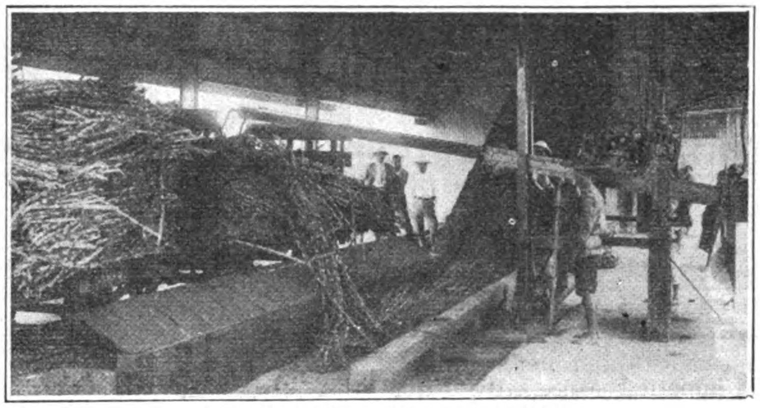
Under these regulations any person wishing to erect a modern style sugar mill had to obtain the permission of the director of the sugar bureau, and when that permission has been granted the director fixed the district within which the mill was allowed to collect cane for the use of the mill. When the limits of such a district were fixed or altered a notification is published in the official gazette of the Formosan government to that effect. These



The Kohekirin Mill of the Formosa Sugar Company

regulations also provided that the farmers who occupy or cultivate land within any district allotted to a sugar mill, approved of by the sugar bureau, must sell all their cane to that mill, and no other mill may be erected within this allotted district. This meant, of course, that the sugar mill in any given district had a monopoly of the cane grown there by the farmers, who, moreover, were forbidden to sell their cane to any other district, or to use their cane for the manufacture of any other material except sugar.

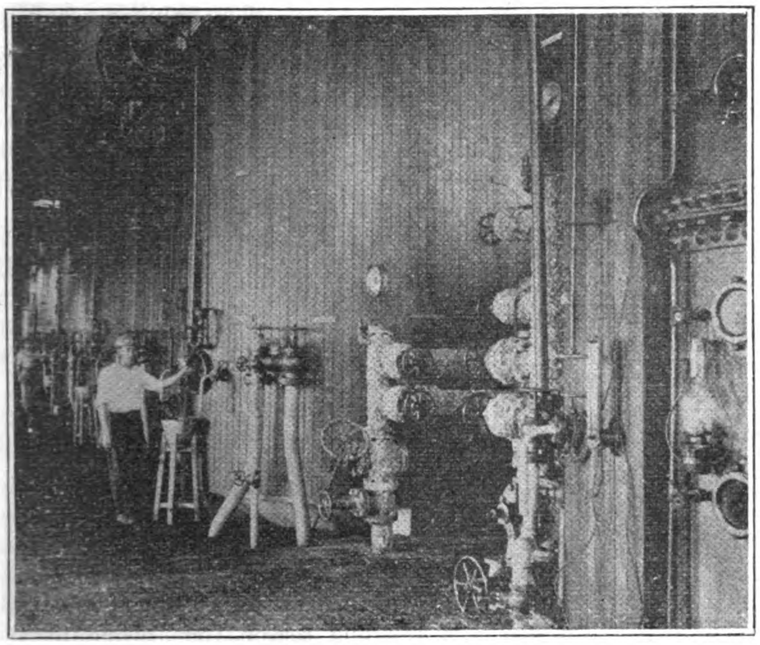
Under the regulations of 1905 nine modern mills sprung up in two years, with a total paid-up capital of over Y.17,500,000. The regulations had the effect of quadrupling the plantings in only three years.



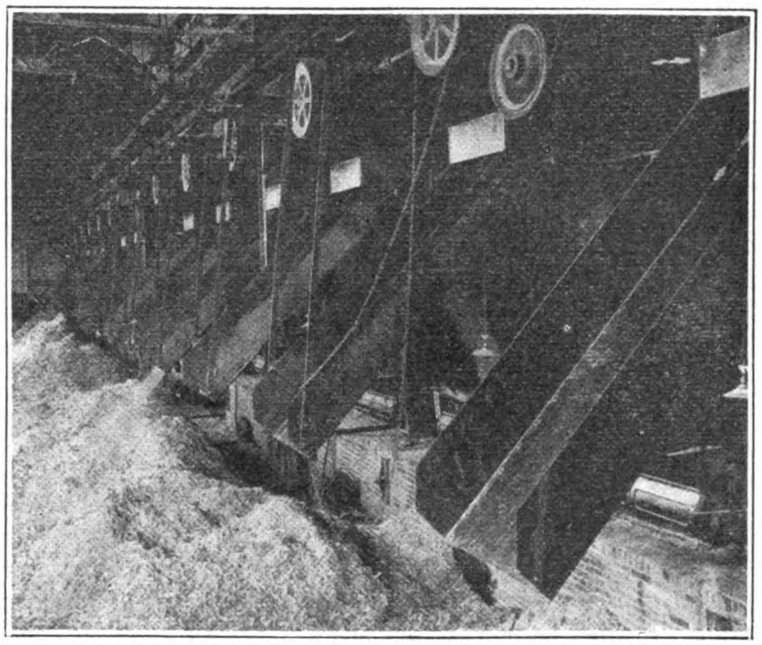
Cane Unloader at the Kyoshito Mill

All the new mills were erected without any subsidy or assistance from the government, and as the sugar bureau had justified its existence and attained its objects, it turned its attention to the encouragement of the planting of a better class of cane.

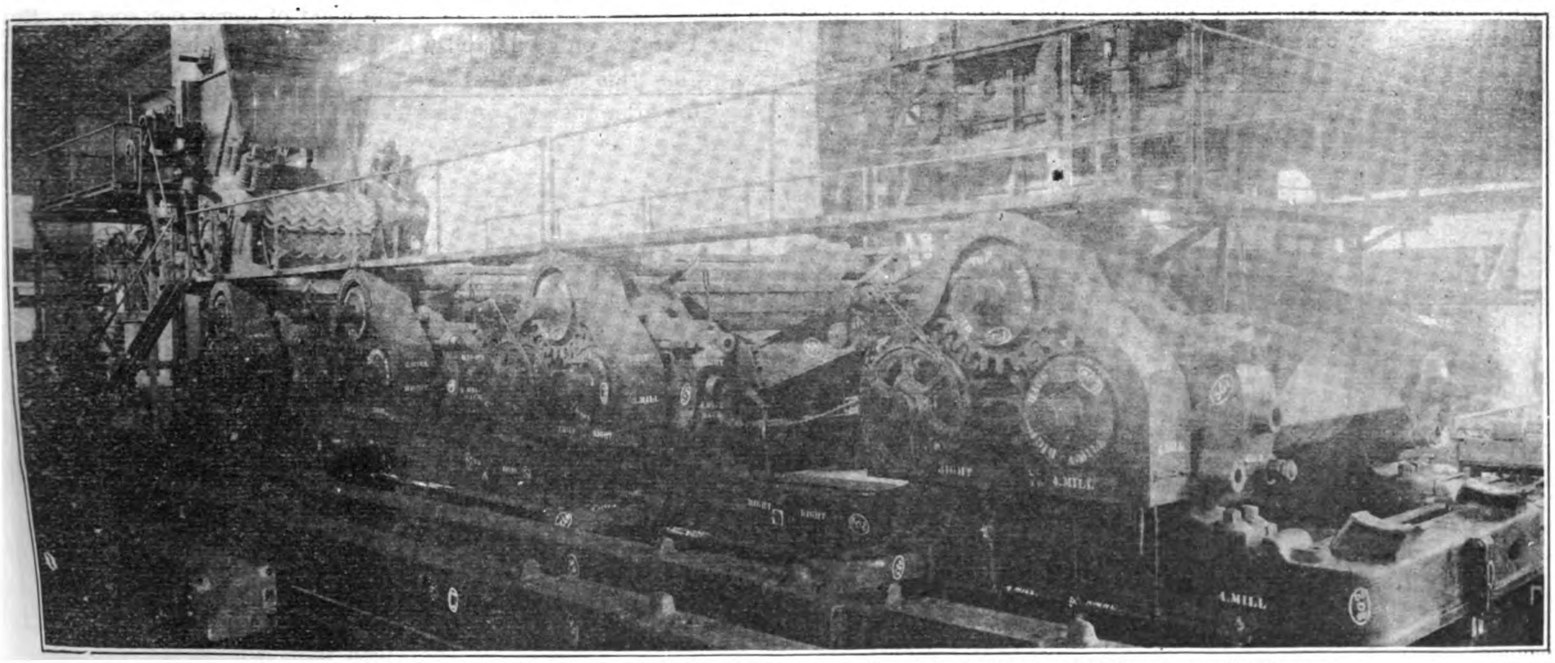
The native species of cane had so deteriorated in sugar content that it required little effort on the part of the authorities to encourage the cultivation of the better plants, the seed for which was imported from Hawaii, Java and Australia. Together with the improvement of the cane, irrigation projects were carried out and steam plows imported. On the Kohekirin estate several sets of Fowler steam plows worked by cable were placed in operation obtaining the same excellent results as followed the use of these



Vacuum Pan Floor of the Ako Mi



Boiler Room in the Ako Mill Showing Bagasse Feed to Boilers and Excess Fuel Shutes



12 Roller Mill and Krajewski Crusher built by the Honolulu Iron Works for the Formosa Sugar Company

machines in Cuba and other large cane-producing countries. The rapid improvement of the cane species was followed by a considerable extension of area under cultivation. In 1908 there were 68,645 acres under cane, of which 28,055 were planted with native varieties and the remainder with improved and imported canes. By 1910, the area had increased to 162,108 acres and the yield per acre increased by 13 per cent. where formerly this had averaged only 8 per cent., with an improvement of nearly five per cent. in the amount of sugar extracted from the cane. The area under cultivation in 1917 was over 281,890 acres yielding over 700,000,000 pounds of sugar per year.

Formosa Sugar Company: Private Railway Bridge, 5,300 feet long over the Tamsui River

An official Japanese bulletin on the sugar industry issued at the beginning of last year, gives the number of modern mills in Formosa as 40, with an aggregate capacity of 30,000 tons of cane per day. The output was formerly confined to centrifugal sugar for the Japanese refineries, but white sugar is now being turned out at many of the larger mills and finds its way direct to the consuming market. The output of these mills, says the official bulletin, is often restricted because cane planting gives way to rice when prices for this latter commodity are high, and also because of weather disturbances.

This observation bears out the statement of Mr. George Fairchild of Manila, to the effect that the sugar crop of Formosa is incapable of much further expansion because of the demands upon the land for the more necessary life giving staple. This weight upon the expansion of the industry will grow heavier as the years pass and still further reduce the area of lands available for sugar cultivation.

A Formosan Cane Field

So far as can be ascertained practically all the available sugar cane districts in south Formosa have been allotted under the sugar laws to various central factories. Outside of some 10,000 acres on the east coast of the island there is little land available for the further profitable expansion of the industry.

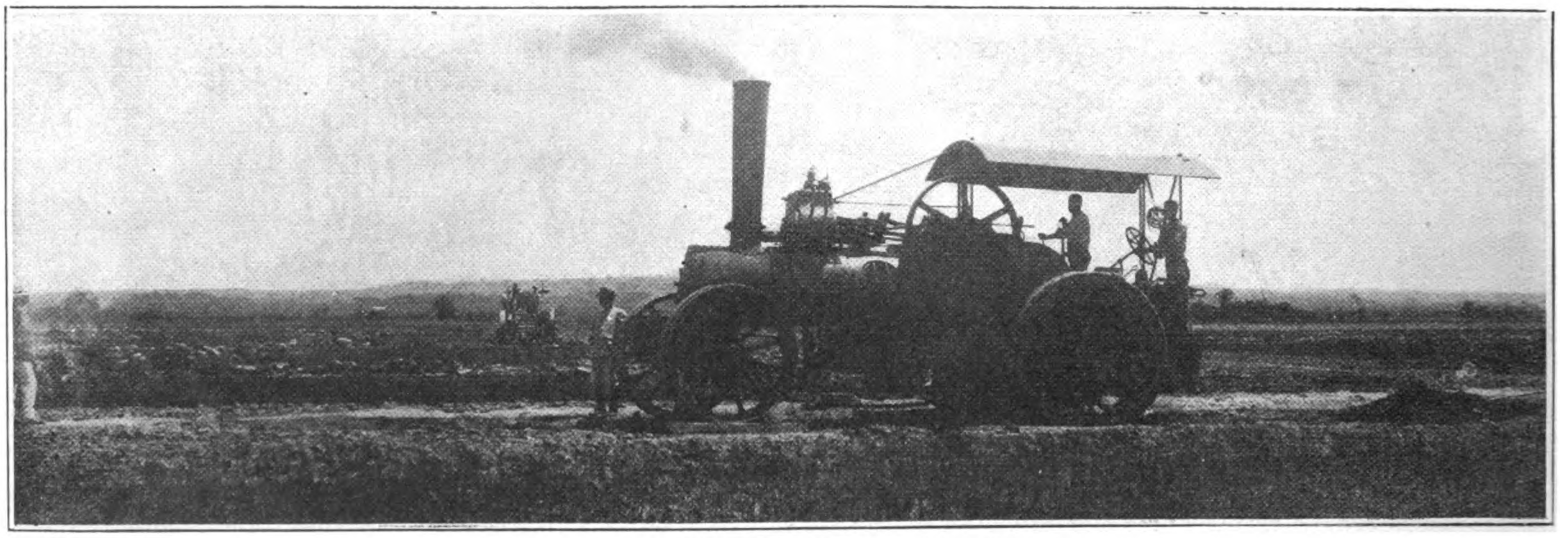
The official bulletin gives the following table showing the output of sugar in Japan proper and Formosa for the ten years ending 1919:—

(In Thousands)

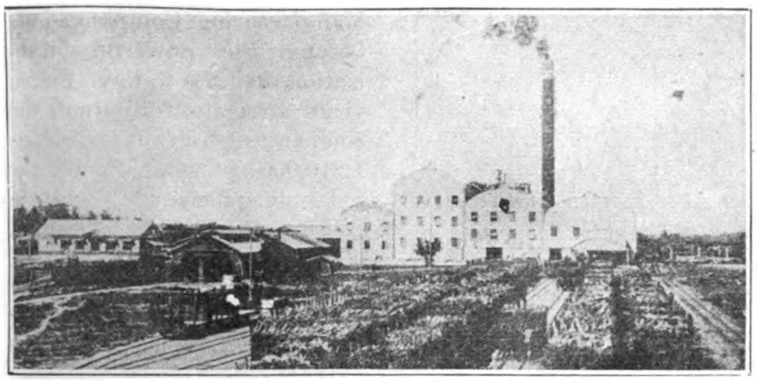
Year	In Jap. Proper.	In Jap.	Total.
	Pcls.	Pcls.	Pcls.
1910	1,051	3,404	4,403
1911	1,112	4,506	5,618
1912	1,121	2,926	4,047
1913	1,167	1,192	2,359
1914	1,451	2,513	3,964
Average for the above five years	1,180	2,908	4,028
1915	1,157	3,474	4,631
1916	1,601	5,351	6,952
1917	2,141	7,635	9,776
1918	1,421	5,735	7,156
Average for the above four years	1,580	5,549	7,129
1919	1,618	4,863	6,481

The last report of the Bank of Taiwan for the period ending June 30 ultimo, gives the output of sugar for the 1920-21 season at 4,000,000 piculs, an increase of 500,000 piculs over the preceding season, but owing to the decline in prices the loss on the crop amounted to Y.50,000,000.

Marked as has been the progress of sugar production in Formosa in recent years, it is still far behind the rate reached in Java in some essential particulars. The yield of sugar per acre in Formosa averages only one and a half tons, against an average of five



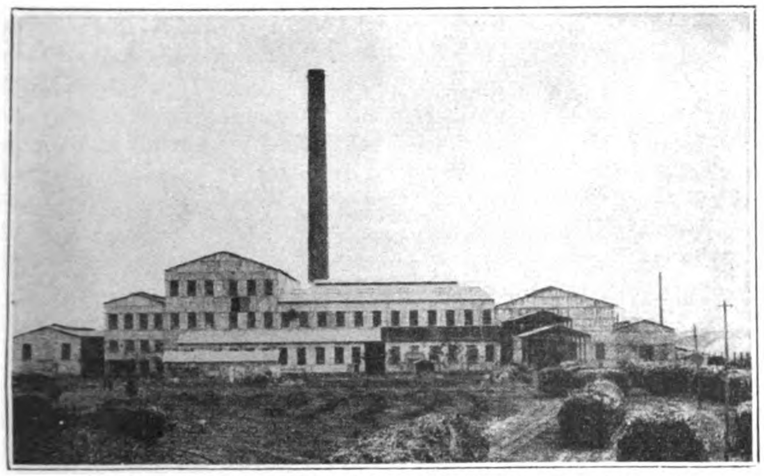
A Fowler Steam Plow on the Kohekirin Plantation



The No. 1 Mill of the Meiji Sugar Mfg. Co., Ltd. at Shorosho, Formosa

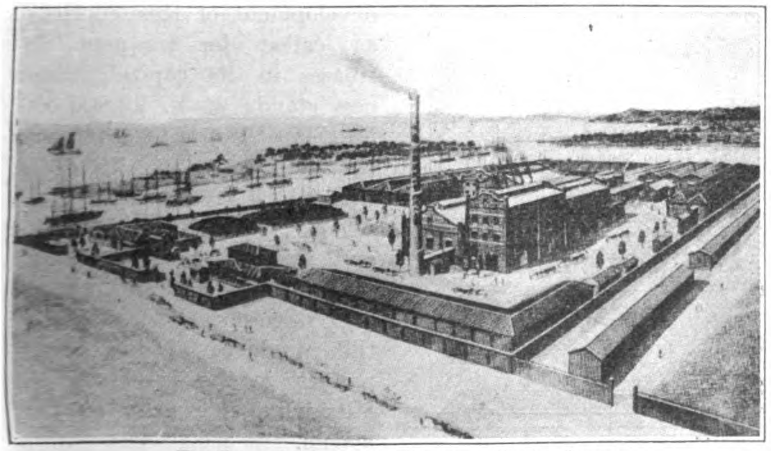
tons to the acre in Java and the Hawaiian Islands, a difference due largely to better irrigation and rotation of crops or permitting the land to lie fallow, whereas in Formosa the land is pushed to its limit of production and irrigation is inadequate. Wages in Java are also much lower, while Formosa enjoys a protective tariff of Y.3.10 per picul.

The equipment of the Formosan mills make up for many draw backs in other directions. The best machinery that can be procured has been installed irrespective of nationality of makers,



The Hokko Factory of the Oriental Sugar Mfg. Co. of Formosa

and, whereas the Honolulu Iron Works holds the record for the number of American mills erected there are many equally fine plants equipped with British machinery. The Harvey Engineering Company, one of the foremost manufacturers of sugar machinery in Great Britain have erected several mills and the Mirrless Watson Company, Ltd., have also some fine installations to their credit. All of the larger Formosan centrals are equipped with multiple mills and crushers, in which the maximum percentage of juice is extracted from the cane. The same excellence of equipment is

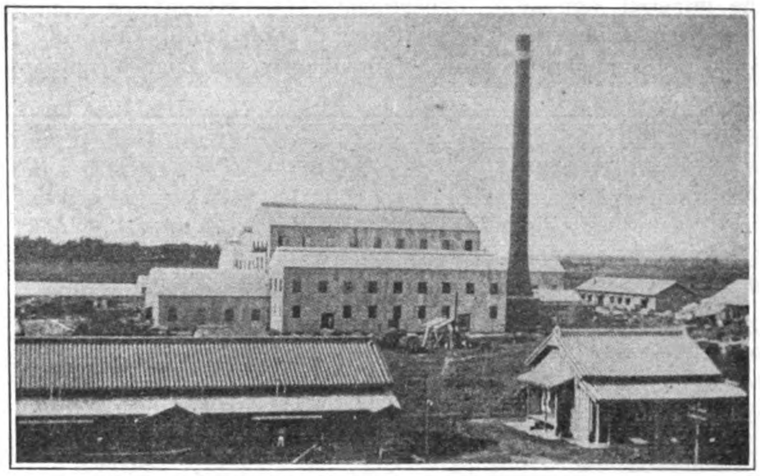


The Imperial Sugar Refinery at Kobe, Japan

found throughout all the various departments of defecation, clarification, filter presses, multiple effects, vacuum pans, crystallizers, centrifugals, cane loading and unloading devices, etc.

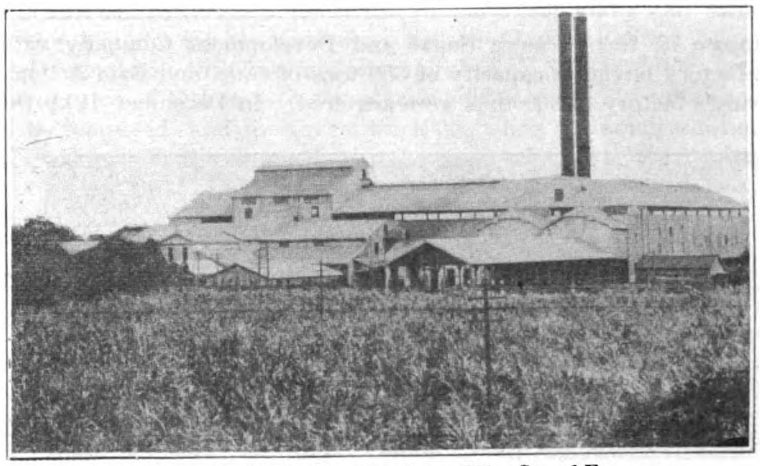
Taiwan Sugar Manufacturing Company

The most important of the Formosan sugar companies is the Taiwan Sugar Manufacturing Company, Ltd., more generally known throughout the Orient by its Japanese name of the Taiwan Seito Kabushiki Kaisha. This company was originally formed in December 1900, with a capital of Y.1,000,000, half paid up. The sugar market in Japan then offered every inducement for such an enterprise, as apart from the small output of some of the southern islands, Japan was entirely dependent upon foreign grown sugar. Formosa was an ideal sugar country and any Japanese



The No. 2 Mill of the Ensuiko Sugar Company, Formosa

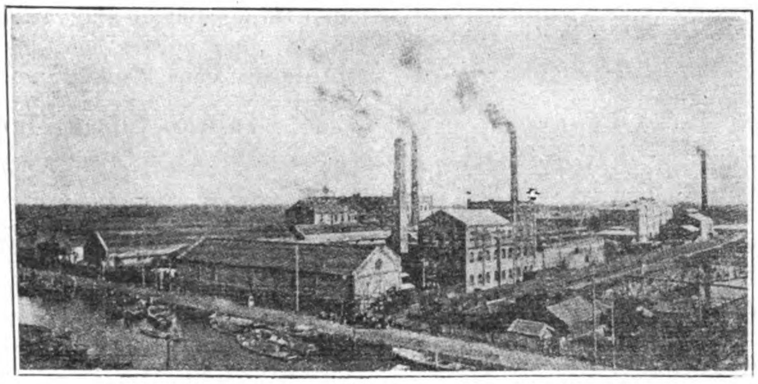
company that could overcome the initial difficulties was certain of success. The president and manager of the newly created company went to Formosa to inspect and report on the adaptability for sugar cane cultivation of the fields in the provinces of Ako and Tainan. They decided to make a start with a small factory of about 250 tons of cane per day and purchase the cane from the farmers along the same lines as the central factories of Cuba and elsewhere, but this plan had to be abandoned as it was seen to be



Nansei Factory of the Oriental Sugar Mfg. Co. of Formosa

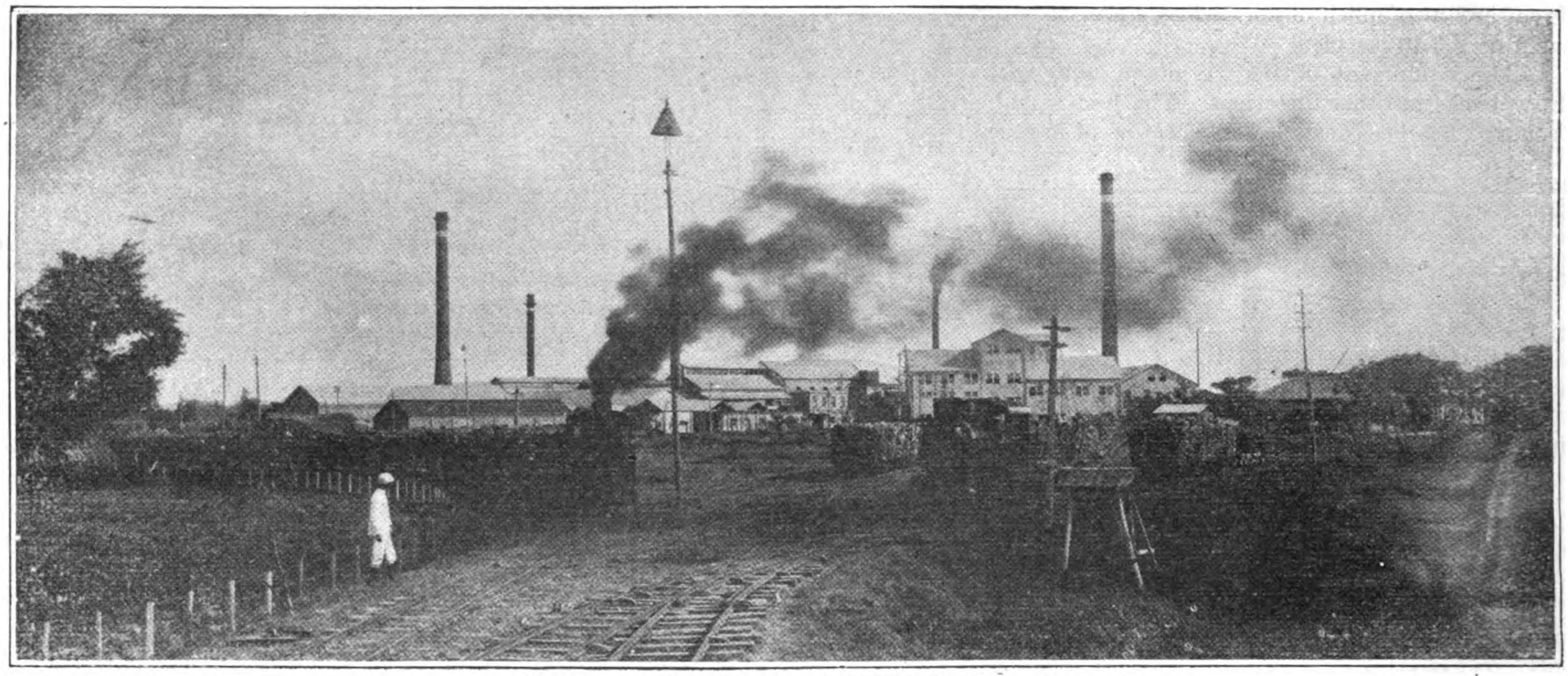
more profitable to purchase the land and cultivate the cane themselves. The new project was put before a meeting of the shareholders on January 5, 1901, and it was resolved to call up the balance of the capital (Y.500,000) and devote the money to the purchase of about 2,450 acres. This venture was not entirely successful owing to the poor selection of seed, the prevalence of fever amongst the laborers, and the exposure to attacks by aborigenes and bandits. A very difficult period was experienced before the production of cane and sugar became regularized. In August 1906 it was decided to

increase the capital to Y.5,000,000 and erect other factories. The success of this company soon attracted others into the field. The Daito Sugar Manufacturing Company was established at Ako, with a capital of Y.5,000,000, the majority of the shares being subscribed by the shareholders of the Taiwan Company. The amalgamation of the two companies took place in April 1908, and 9,000 shares of the joint stock of Y.100,000,000 taken up by the imperial household department. The reorganized concern then bought out the Taiwan Sugar Manufacturing Company in August of the following year. Subsequently, the English company, known as the Formosa Sugar and Development Company, with a factory having a capacity of 850 tons of cane, and Bain & Company's factory of 300 tons were acquired. In December 1911 the Kobe Sugar Manufacturing Company was absorbed at a cost of Y.950,000. By these purchases and amalgamations the Taiwan Sugar Manufacturing Company, Ltd., became the powerful organization that it is to-day. Eleven years after its formation the company's output reached 1,210,000 piculs, which was not only sufficient for domestic consumption but permitted export to other Far Eastern countries. In July 1914 the Horisha Sugar Manufacturing Company, and in September 1916 the Taihoku Sugar Company were amalgamated with the larger Taiwan Company.

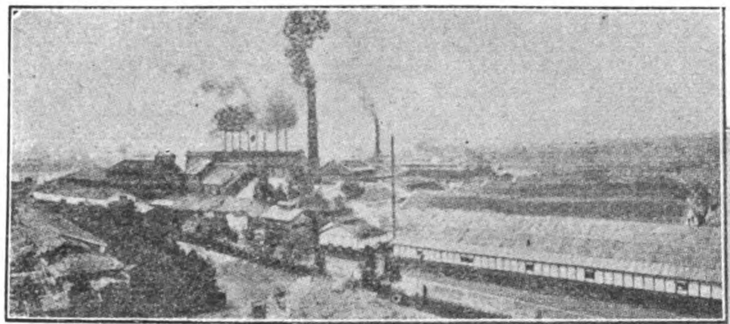


The Tokyo Refinery of the Japan Sugar Mfg. Co., Ltd.

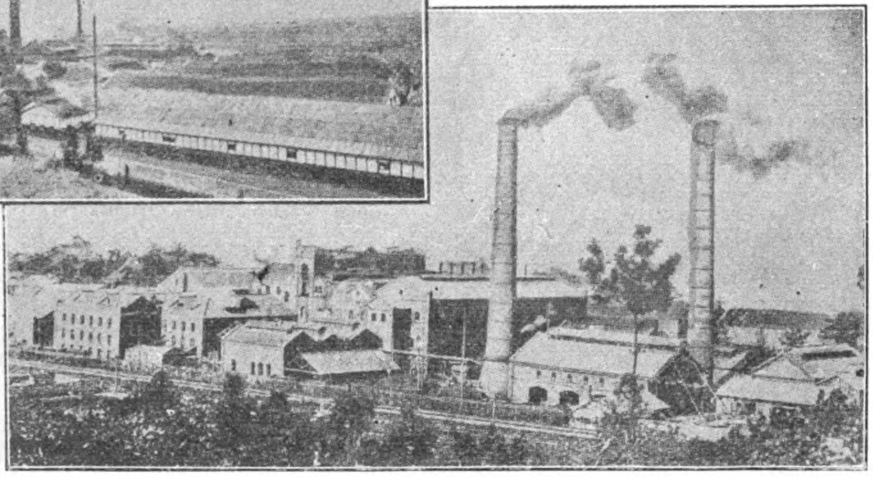
To-day, the Taiwan Company owns and operates ten mills, eight in South Formosa, one in the centre of the island and one in the North. The mill at Ako is the largest, with a capacity of 3,500 tons of cane per day. In addition, there are two alcohol distilleries in southern Taiwan, and two refineries at Kobe. The total acreage under control of the company is over 36,500 acres. It has over 400 miles of private railways for cane transportation, with wharves, lighters and other minor plants. Of the 400,000 tons produced by twelve companies of Formosa, the Taiwan Company alone turns out over 120,000 tons, or about 30 per cent. of the total, and it produces about half the alcohol used in Japan. The development of this company as called for frequent increases in its capital, which now stands at Y. 29,800,000. Mr. Shiro Fujita is chairman of the board of directors, with Mr. T. Yamamoto as senior managing director and Mr. T. Takechi and Mr. T. Masuda as managing directors. The sale of the products of the company is in the hands of the Mitsui Bussan Kaisha as sole agents.



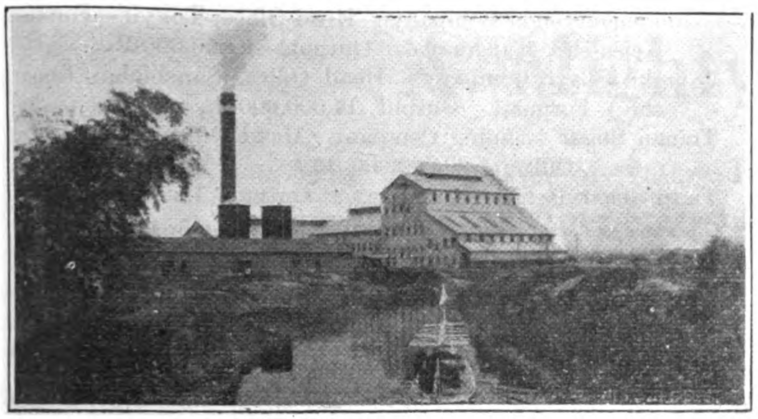
The Kyoshita Mill of the Formosa Sugar Company



Osaka Refinery of the Japan Sugar Mfg. Co., Ltd.



The Dairi Refinery of the Japan Sugar Mfg. Co., Ltd.



The Kobekirui Mill of the Formosa Sugar Co.

The Oriental (Toyo) Sugar Manufacturing Company

This company was established in 1907 with a capital of Y. 5,000,000 and at once began planting on an extensive scale, turning out 1,000 tons of sugar the first year and 2,000 tons the next. A year after its organization, the profits were Y.673,000 on an income of over Y.2,000,000. This company also started in to absorb its smaller neighbors and the Toroku Sugar Company was taken over in 1914, increasing the capital by Y.1,200,000, and several other smaller companies followed in 1915. The Hokko and Tamaki Sugar Companies were absorbed in 1916, bringing the total subscribed capital of the Oriental Company up to Y.11,750,000.

The Oriental Company has extensive plantations and large up-to-date mills. Its head office is at Nanseisho, Kagi prefecture, Formosa, with a Tokyo office in the Mitsubishi building. Mr. T. Shimosaka is president, with Messrs. Goro Matsukata, K. Komatsu, K. Fujita, S. Matsukata, R. Hyuga, R. Oka, S. Ishikawa and T. Tamura as directors.

Meiji Seito Kabushiki Kaisha

This company, more generally known as the Meiji Sugar Manufacturing Company, started its factory at Shoro in Formosa in December 1908, with a capacity of 750 tons of cane per day. The Santaw factory with a capacity of 1,000 tons was established in November 1910, and the Soya factory at Tainan with a capacity of 1,000 tons of cane per day in January 1912. At the same time, the company turned its attention to refining, and in January 1912 an amalgamation was effected with the Yokohama Sugar Refining Company and the capital increased to Y.10,000,000. Refining was begun at the Kawasaki Refinery, in Kanagawa prefecture, with an output of 200 tons of refined product per day. In July 1913 the Chuo Sugar Manufacturing Company with a plant at Nanto, Formosa, having a capacity of 750 tons of cane per day was absorbed, and the capital increased to Y.12,000,000. As the export trade began to assume large proportions which the Kawasaki Refinery was unable to meet, the Tobata Refinery was established in Fukuoka prefecture in July 1916 with a capacity of 100 tons of refined sugar per day. The maufacture of bye-products was entered into, and at the Santaw mill a large distillery was installed to make alcohol from the molasses. The Kawasaki Refinery is now equipped to turn out cube and powdered sugar. The capacity of the properties belonging to this company is over 3,500 tons of raw sugar per day, of refined sugar about 300 tons and 280,000 gallons of alcohol per year. The company is also considering the manufacture of confectionery and condensed milk. The president of the company is Mr. H. Soma with offices at No. 1 Yurako-cho Kojimachi-ku, Tokyo.

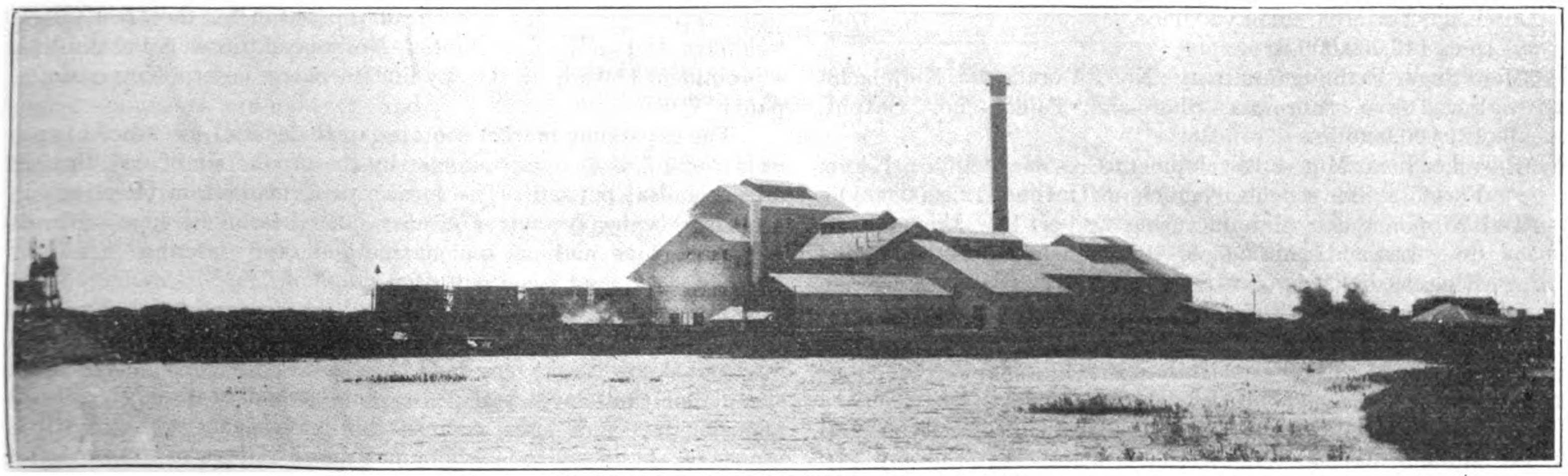
Imperial Sugar Company, Limited

The Imperial, or Teikoku Seito Kabushiki Kaisha, holds a prominent position in the sugar industry of Japan. The founders of this company Messrs. K. Abe, H. Yamashita and S. Matsukata, started in October 1910 with a capital of Y.5,000,000 which has since been increased to Y.15,000,000. It now operates five mills in Formosa situated as follows: Nos. 1 and 2, at Taichu; No. 3, at Tanshiken, Taichu; No. 4, at Suidensho, Shinchiku and No. 5, at Sankatutensho, Shinchiku. Alcohol distilleries are located at Taichu and Suidensho in the Shinchiku district. A large and well-equipped refinery is operated at Higashi-Shirike, Hyogo, near Kobe.

The total output of the five mills is over 2,500 tons of sugar per day. The company is engaged in all branches of the sugar industry and actively associated with the transportation business of the island where it operates the following railway mileage: 38 miles at the Taichu mill, 17 miles at the Shinchiku and two miles at Tanshiken, with an equipment of ten locomotives and nearly 600 freight cars. General passenger and goods traffic is handled over a distance of ten miles between Taichu and Mantoroku with a hand car service for another distance of 28 miles. They also operate their own fleet of steamers. The president and managing director of the company is Mr. S. Matsukata with head offices at No. 14 Taichu, Formosa, with a Tokyo branch at No. 1 Ginza, Shichome, Tokyo.

Japan Sugar Manufacturing Company, Limited

This company was organized in January 1896 under the name of the Nippon Seisito Kabushiki Kaisha (Japan Refined Sugar Company, Ltd.) with the modest capital of Y.300,000, but with the opening of Formosa to sugar cane cultivation, the capital had to be increased, and in November 1906, when an amalgamation was made with the Japan Sugar Company of Osaka, the capital was raised to Y.12,000,000, and the present name adopted. In August of the following year, the Dairi Sugar Refinery was



The Sharoken Mill of the Taiwan Sugar Mfg Co.

purchased and gave the company its present premier position in Japan's sugar trade.

In 1908 the first mill was erected at Gokenseki, Kagi prefecture, Formosa, and a second mill in 1912. With the two refineries in Tokyo and those in Osaka and at Dairi, the company has a daily capacity of over 850 tons of refined sugar, in addition to the output of rock candy, alcohol in Tokyo and cube sugar in Osaka. The two mills in Formosa have a capacity of 2,200 tons of sugar per day drawing their cane supplies from an area of over 180,000 acres, of which, 6,000 acres are cane lands belonging to the company. More than 111 miles of railways are operated for the exclusive use of the company.

The present capital of the company stands at Y.18,000,000 with Mr. Raita Fujiyama (president of the Tokyo chamber of commerce) as president, and Messrs. N. Takayawa and R. Ito as managing directors. The head office of this company is at No. 12 Sanchome, Kakigara-cho, Nihonbashi-ku, Tokyo.

Dairi Sugar Refinery

The Dairi Sugar Refinery of the Japan Sugar Manufacturing Company is located within ten minutes tramway ride from the port of Moji and covers about 35,000 *tsubo* of land. The machinery is from the best American and British makers, the power plant being operated by two engines from Harvie & Company, with Babcock & Wilcox boilers, two General Electric generators and several motors. It gives employment to 250 laborers and an clerical force of 50. The annual output is over 1,300,000 piculs, of which the larger part is exported to China where the company has carefully studied the requirements of the market. The raw product is imported not only from Formosa, but from the Philippines, Java and Cuba. The South Seas, India, Russia and other parts of Asia are large purchasers of the refined products of this company, which are marketed through well-known Japanese firms, such as Mitsui Bussan Kaisha, Suzuki & Co., Yuasa & Co., Fukuwaya Co., Okura & Co. and Abe Companies. The general manager of the refinery is Mr. K. Akiyama.

The Ensuiko Sugar Manufacturing and Development Company

This company was established by Mr. Osetsuno in 1903 with a capital of Y.300,000. It was afterwards reorganized with a capital of Y.7,875,000. The company operates two mills with private railway system, turning out about 18,000,000-lb. of raw product per annum. Its head office is at Shinyei-cho, Kagi prefecture, Formosa, with a branch at Tokyo. President, I. Arai ; Managing Directors, T. Maki and S. Fujisaki.

The names of the various companies operating mills in Formosa are as follows:

*Taiwan Sugar Refining Company, Ltd. : Head Office, 22 Honkokucho-Nihonbashi-ku, Tokyo. Formosa, Kyoshito-sho, Tainancho. Output, 219,970,000-lb.

*Oriental Sugar Manufacturing Co. : Head Office, Nanseisho, Kagi, Formosa. Tokyo Office, Mitsubishi Building. Output, 146,000,000-lb.

*Meiji Sugar Refining Company : No. 1 Yurakocho, Kojimachi-ku, Tokyo. Formosa, Shoro-sho, Tainan-cho. Output, 121,000,000-lb.

*Ensuiko Sugar Mfg. & Development Co. : Head Office, Tokyo. Formosa, Shinyei-cho, Kagi-cho. Output, 122,000,000-lb.

*Dai Nippon Sugar Manufacturing Co. or The Japan Sugar Co., Ltd.: Head Office, 12 Sanchome Kakigaracho, Nihonbashi, Tokyo. Formosa, Gokenseki-sho, Kagi-cho. Output, 91,000,000-lb.

*Taihoku Sugar Company (Imperial Sugar Co.): Head Office, 14 Taichu, Formosa. Tokyo Branch, 1 Ginza Shichome. Output, 82,000,000-lb.

*Niitaka Sugar Manufacturing Co. : Head Office, Tokyo. Formosa, Chikuishi, Churyo-sho, Taichui-cho. Output, 67,000,000-lb.

*Rinhongen Sugar Company : Head Office, Tokyo. Formosa, Keisu-sho, Taichu-cho. Output, 40,000,000-lb.

*Shinko Sugar Company : Head Office, Sanshicho, Tainancho. Formosa. Output, 14,000,000-lb.

Tainan Sugar Refining Company : Head Office, Tainan, Formosa. Output, 20,000,000-lb.

Taito Sugar Refining Company : Output, 4,000,000-lb.

Those marked with asterisk (*) operate plantation railways.

Romance in a Tank

NOWHERE in the world have long-established manufacturing companies had more interesting histories than those presented by certain American firms. The development of the iron and steel industry is a typically American story, and the histories of companies whose fortunes have been linked therewith reflect the commercial prowess characteristic of the greatest drama in the American industrial arena. A pioneer in this field was a Chicago builder of bridges and tanks. In 1865 steel tanks were already in limited use, but in that year this inventor produced a new type—with a self-supporting bottom—and organized a company to manufacture it.

Thereupon the Chicago Bridge & Iron Works began to revolutionize the elevated tank industry. The new principle of the hemispherical self-supporting bottom marked the invention as something much more important than a mere steel imitation of the ordinary wooden tank. This principle meant the elimination of the expensive grillage neceassary to support flat bottoms. It meant the reduction of cleaning and upkeep costs. It meant that danger from leakage and bursting practically ceased. In short, the erection in 1892 of the first elevated steel tank with a self-supporting bottom, marked a milestone in the history of modern engineering.

This invention was produced at a time of phenomenal industrial expansion. It was therefore assured a market which grew by leaps and bounds, at home and abroad, until to-day thousands of elevated steel tanks are seen in every quarter of the globe. The new industrialism drew increasing number of people into the cities, and the problems of sanitation and general water supply became acute. Modern sanitary engineering made increasing use of the elevated steel tank for municipal water storage. The problem of the protection of property—the fruit of all this commercial prosperity—from fire, became pressing. The timely invention of the automatic sprinkler system offered another use for steel tanks.

Against this tremendous tide of industrialism a new interest in human welfare was meanwhile making headway. A growing sympathy for the less fortunate classes of society—the public wards in asylums and poor-houses—and a recognition of their human rights, made the use of facilities for fire protection popular in public institutions. Many automatic sprinkler systems have been installed in response to this demand.

The growing regard for both life and property led many cities to pass laws requiring this form of protection for theatres, public buildings and industrial plants. Nowadays the elevated tank is a prominent feature of the sky-line in every enterprising municipality.

The expanding market soon began to demand specialized types of tanks. This demand was met by the production of an elliptical and a conical bottom. The former performs certain functions in municipal water systems, and also—like the conical type—affords an expeditious and convenient method of "watering" railway engines.

Thus the Chicago Bridge & Iron Works answered the challenge of a developing industrialism. The production of specialized types of elevated steel tanks may indeed be said to have in some measure stimulated that development. Certain it is that to-day in both hemispheres there rises against the horizon an ever-spreading forest of these symetrical monuments to American engineering genius.

A Mighty Enterprise

The Phosphate of Lime Industries of the Central Pacific
The Amazing Story of Ocean and Nauru Islands

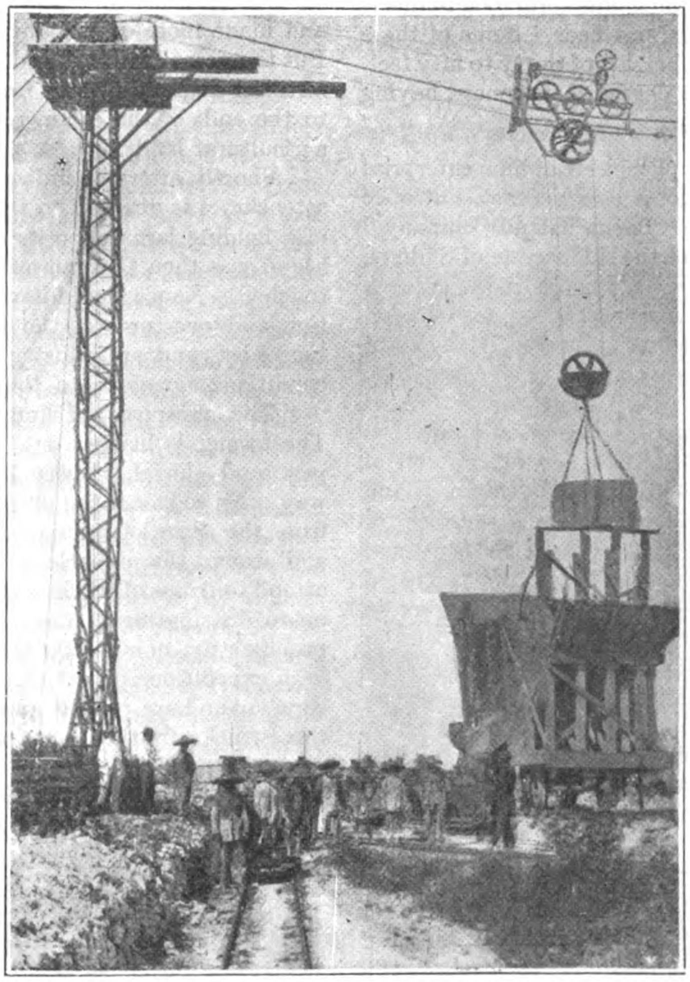
Written and illustrated by Thos. H. McMahon, F.R.G.S.

THERE is no exaggeration in the opinion that in the history of enterprise there is to be found no more impressive demonstration of pluck and endeavor that in the truly up-to-date wonderful and interesting phosphate-of-lime industries of Ocean and Nauru Islands, of the Central Pacific. Ocean Island is but 1,000 acres in extent and Nauru 5,000 acres, both islands lie in Latitude 0 degrees 52 minutes S. and longitude 169 degrees 35 minutes E. both are within 50 miles of the equator and are 160 miles apart. These islands—the first British and under British administration, the second formerly German but now under mandate given to the British empire and governed by Australia, are nature's store houses of a very high-grade phosphate of lime, a magic plant food and general fertiliser.

By the magnitude of its operations this enterprise has given a significant value and importance to the Central Pacific, a little-heeded, little-known part of the globe.

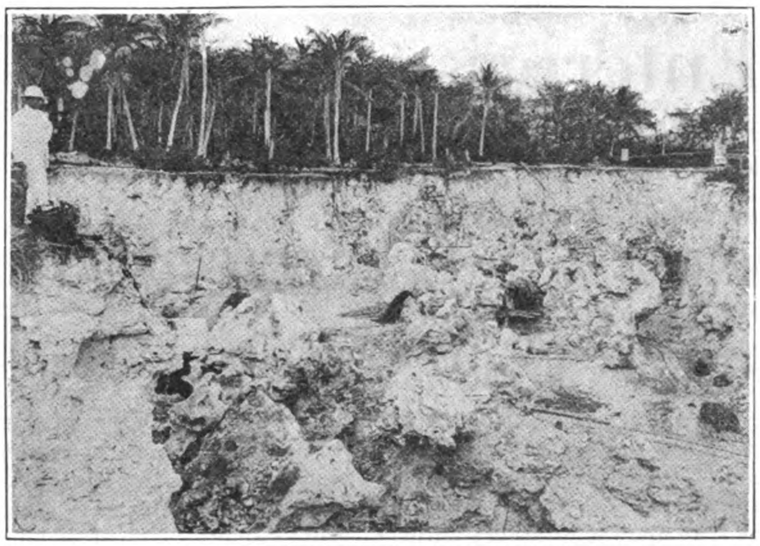
A thousand people, white, yellow and brown are engaged in this industry and increasing trade will soon necessitate the employment of many hundreds of extra hands. The greater number of white employees are British, Scotch and Irish, but there are also many Americans and Australians. There are some three hundred of Gilbert Island natives, some three hundred Chinese at Nauru, these supplemented by hundreds of natives from the Marshalls, and the Carolines groups and a small number of Nauru islanders.

The bounteousness and wonders of nature are shown in the composition of this magic product phosphate of lime. For years—it is impossible to compute how many—countless numbers and generations of sea birds were attracted to these two tiny islands, where there was neither man nor animal to disturb them, and where there was that superabundance of fish usual to deep sea coral island. The birds subsisted to repletion on the fish, and created vast deposits of guana, rich in phosphate, which, mingling with the coral rock, rich in lime, and by the powerful process of nature, assisted by periodic and alternate droughts, copious rains, and occasional and complete submergings by the sea waters, were assimilated in one potent chemical factor—phosphate of lime, a buff colored rock, that contained the all-essential virtues of a prime fertiliser. To-day there is scarcely a bird to be seen on these islands, but there remain a rich treasure handed over to the use and ingenuity of men.

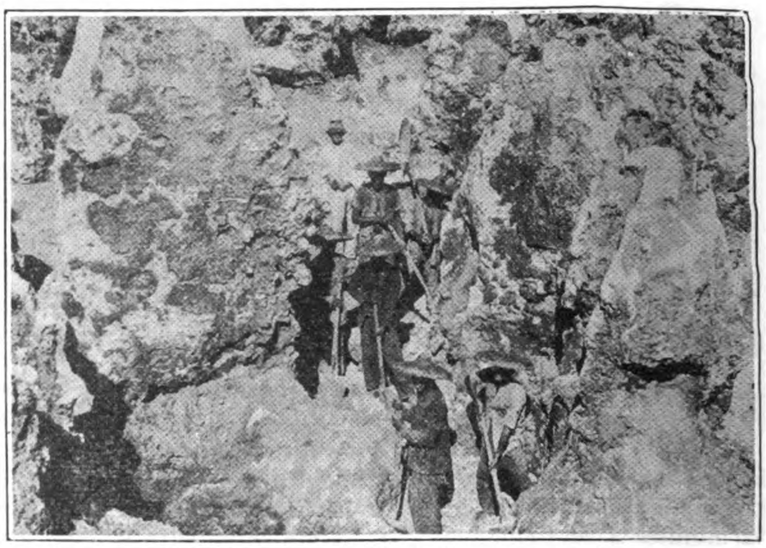


Cable Transmission used on Nauru Island for Transporting Baskets of Phosphate Rock from the Fields to the Railway Cars

How many people will credit that in the silence, the vastness, of the little-known Central Pacific two modern towns have been upreared, two settlements of industrial activity having every convenience and comfort of civilized life and throbbing with the energies of a great modern enterprise! Day and night there are the crash and buzz of heavy machinery, the clangour and din of many workshops, the beats of steam hammers, the roar of furnaces from smithies and foundries, the shrill sirens of locomotives, the deafening rumble and rattle of phosphate-laden trucks rushing across overhead bridges or along busy railroads, bringing from the fields the precious phosphate rock to crushers, dryers and enormous storing bins, there to be ready for prompt distribution to the very ends of the earth. Striking features of the magnitude of the industry at both islands are the immense spider-like cantilever jetties fronting the settlement bestriding the reef, and breasting to the full the open sea, sometimes turbulent, and the sudden changes of winds making the loading of steamers under such conditions a work of great skill and some difficulty. This loading is also interesting, and, when a steamer is standing by, goes on night and day without a break. An endless circle of surf-boats with three shifts of men plies between the jetties and the steamer each carrying cane baskets capable of holding, per load, nearly three tons of phosphate. The boats pass under the end of the jetties, and from great shoots the phosphate is dropped into the baskets in a most expeditious manner. Thus laden, they are tugged off to the steamer by powerful launches, the baskets hauled up, and capsized into the holds of chartered 7,000-ton steamers. Natives, ghost-like in appearance from the fine cream colored dust that pervades the atmosphere, load the boats and trim the phosphate into the ships. At night, with the electric searchlights thrown over the scene, the effect is phantom-like in the extreme. A very distinctive feature of these industries is the deep-sea moorings necessary on account of the absence of natural harbors, and permitting of loading in all but the roughest weather. The moorings are remarkable, as they are the deepest, most extensive, and most costly in the world. The buoys, anchors, chains and cables are of gigantic size, designed and constructed for this unique system. It will be a surprise to the reader to learn that on these two tiny islands there is a network of well-laid railroads, steam and electric about 100 miles in all, the lines traversing the intensely picturesque phosphate fields, weirdly



A Phosphate Field at Nauru Island



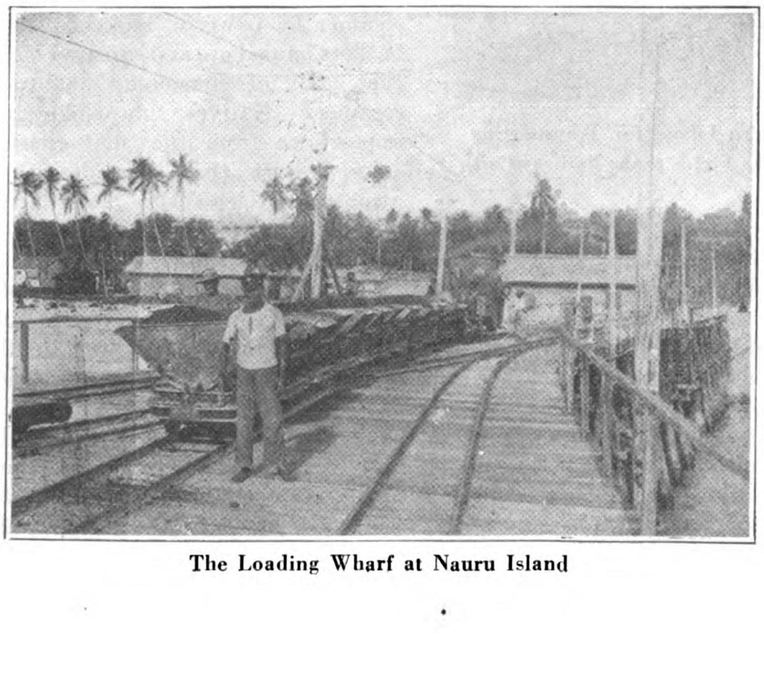
Chinese at Work in a Nauru Island Phosphate Field. They are Prized Laborers

conspicuous in the form of spectre-like and gaunt coral rock pinnacle that obtrude in thousands in the worked out beds. Some of these pinnacles, church-steeple style, tower to heights of thirty to fifty feet. They are weathered to an extraordinary degree of sharpness, having tips so fine as to appear needle-pointed.

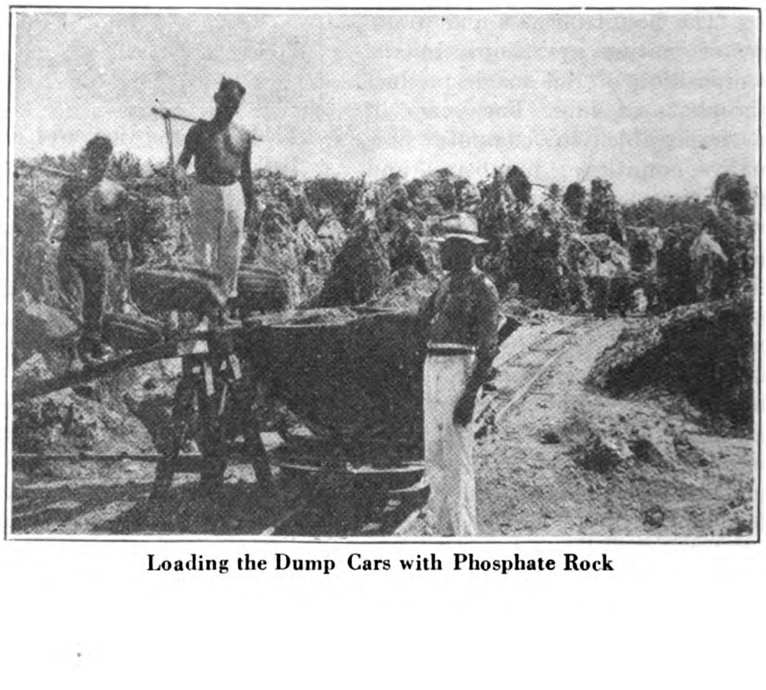
Quite a romance is attached to this phosphate of lime enterprise of the Central Pacific. Many years ago, a now defunct, but once justly famous, commercial concern, the " Pacific Island Company " had a small unpretentious office in one of the side streets of Sydney, New South Wales, Australia. A peculiar looking piece of rock served as a check to keep the office door open. It was tossed here, kicked there, examined curiously by some, but unheeded by most passers-by. A member of the Company's staff one day, who knew something of guano and phosphate rock, took it up, examined it, and subjected it to a chemical test, and as a result of an investigation was set afoot to trade the origin of the insignificant bit of buff-colored rock. A sailor had picked it up on Ocean Island thinking " what a fine stone it would be for making marbles for schoolboys." It proved, however, to be the key to a rich storehouse of nature and to treasure islands in the Pacific. Experts visited the island, and it was quickly realized what possibilities were in phosphate-of-lime as a fertiliser. These possibilities were worthy of a great commercial undertaking, and the first offer to work the phosphate field was made to Australian capitalists who turned it down as having no commercial value. The venture, however, was very eagerly seized by a financial British Company. The setting up of an industry on Ocean Island was an undertaking with heavy expenditure, attended by all the disabilities of inexperience, and made more difficult by the extreme remoteness of the island. But the years of rick passed, the enterprise prospered, and the great fertiliser dug and blasted from the coral rock has gone and is going to the ends of the earth, revitalizing over-used and impoverished agriculturaf lands.

Shortly after the industry at Ocean Island was set in motion, attention was directed to the island of Nauru, adjacent and found also holding large deposits of high-class phosphate of lime. The island was then German-owned, and its valuable product was untouched. Nauru would have remained a waste but for the exploration and overtures of the British Company. British persistency succeeded, and an industry began on the island under terms and conditions agreeable to the German government.

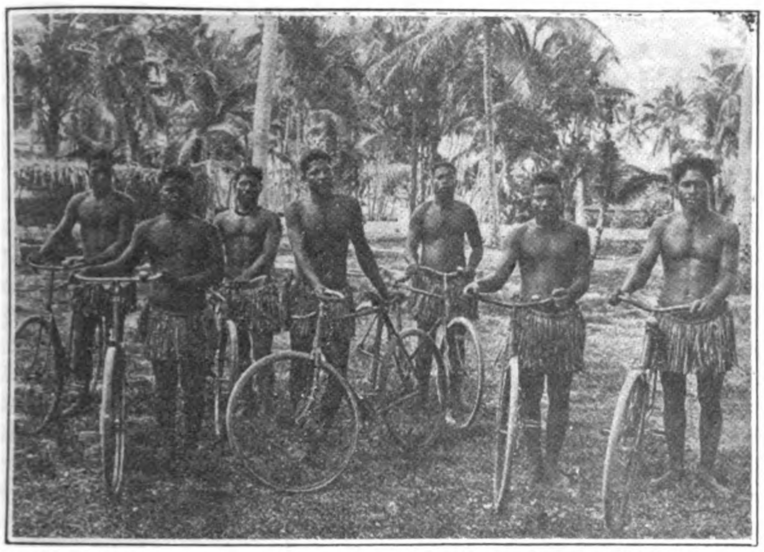
The phosphate of lime is of two classes—rock and alluvial. The former is blasted out, while the latter can be removed with pick and shovel. Every detail is carried out in a systematic way. No sooner is the phosphate rock loosened than it is removed from the scene of mining and tossed into railway trucks running and around the pinnacles of the worked out areas. Gangs of men attend to trains of trucks as the stuff is loaded, and these are pushed on to distributing hoppers, great wooden towers which stand out prominently, dominating the fields. From the hoppers it is by a very expeditious patent of trap-doors dropped on to trucks, which come up and are pushed away and filled with remarkable celerity; these trucks are then sent from the hills down steep declines on the plan of loaded trucks descending as empty trucks ascend. Once on the main lines, at the junction of the declines, small but important looking, puffing railway engines make fast to long trains of the



The Loading Wharf at Nauru Island



Loading the Dump Cars with Phosphate Rock



The Natives of Nauru Island are a Handsome Race. Every Man and Boy Owns a Bicycle and are Expert Riders. The Nauruans are Famous for their Politeness, a Native Cyclist will Never Pass a White Person while on a Bicycle, but will get off and Walk Past and Bow Ringing the Bikebell all the Time

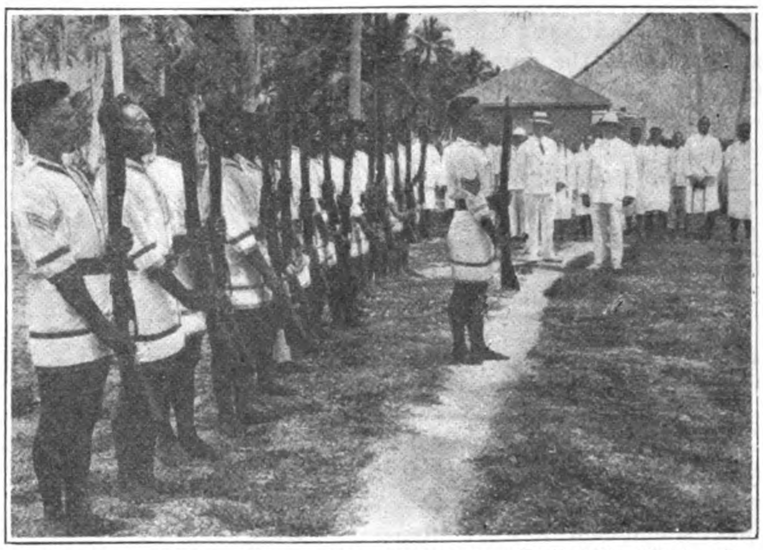
loaded trucks, which have been shunted into place by a number of natives ; and these trains are then backed into the great buildings where the dryers and crushers are at work. The phosphate rock is dumped into wet hoppers, and passed from them to the great crushers, where it is broken up into a size suitable for drying and shipping. From the crushers the phosphate passes into the dryers, revolving cylinders in which the phosphate comes in contact with hot air. All moisture is thus evaporated. After leaving the dryers, the phosphate is taken by elevators and conveyers and distributed to the storage bins, capable on both islands of holding many thousands of tons. Another expeditious and useful patent is attached to these bins in long rows of trap-doors or opening valves, which fill up trucks by the mere pulling of a lever. The trucks are then shunted on to the jetties, and the phosphate passed through the jetty shoots into the surf boats below, as told before, and thence on to the steamers. To prevent stoppage of work in wet weather great areas roofed with galvanized iron are set apart, and here the workers can blast, dig and truck without discomfort of any kind.

The industries stand unparalleled in the tropic world, for the care, attention to, and comfort of the employees. A complete and successful domestic management ensures modern conveniences and comfort to the workers, irrespective of status or color and

Dancing Women of Nauru Island. Adorned for the Fish Dance

free of all charges. The health and entertainment of all are assured by well-planned system of sewerages, fresh and salt water in unstinted abundance, electric light, fresh food supplies, refrigerators and telephones connecting every office, work-shop and house. Every nook and corner of the settlements is lit up at night, giving the impression, when viewed from a few miles out at sea, of an approach to great towns. There is a free daily distribution of ice, with weekly distrbutions of useful household comforts, such as soap, cordials, etc., privileges perhaps unequalled in any industry in the British empire. The employees—white, yellow and black have free houses, free messes, free public laundries. Married men are allowed free houses and extra allowance for living. There are excellent free recreation and reading rooms, sports and tennis grounds, the company supplying reading matter and the implements for recreation and sport in billiard tables, tennis and cricket balls. There are free hospitals replete with operating rooms, dispensaries, furniture and conducted so well as to be without compare in the Pacific Islands. There are American doctors, one on each island, Australian matrons, and native orderlies, medical attention and medicines being free. There is a fish market and the natives of the islands are encouraged to bring in big supplies of fish daily, to be passed on to the various messes, the married people generally employing their own individual fisherman, who for 10s. a month provided any quantity. Asiatic and native laborers are well housed, fed paid, guarded in health, and worked under comfortable conditions, and wise methods as to time and weather.

The Chinese of Nauru have their tea houses and places of amusement, and though they come under a limited time of engagement since the war, they are so contented that each one signs on



The Native Police Force of Nauru Island; a Well-drilled Body of Men, very Useful and Intelligent

repeatedly for a further period of employment. The native workers have commodious dormitories and messes if single. The married men live in electric-lit, tiled-roofed, well finished, cool homes, and they have their dancing grounds for any festivity or rendezvous. On both islands are elegant, and complete stages for open-air entertainments, where high-class concerts and theatrical performances frequently take place to the benefit of patriotic funds, which have received some thousands of pounds. Although within touch of the equator, these islands are remarkably cool and salubrious in climate. The health of the communities has never suffered any epidemics and is maintained by a rigidly strict supervision of water wells, drains and all sanitation. Gardens and pretty hedges beautify the homes, the walks and the streets of the settlements. There is an air of comfort and cleanliness that is delightful, making the settlements ideal.

Three hundred thousand tons of phosphate-rock is exported every year from the islands. This goes to industries in various parts of the world when the rock is broken and graded up by sulphur and sand. Its action in plants as super-phosphate is almost magic.

French Railway Enterprise in Indo-China

M. Sarraut's Scheme

ONE of the most important steps for the development of Indo-China and Far Eastern communications generally, was announced at the last general meeting of the Compagnie Générale de l'Extreme Orient in Paris. This company is a combine of the strongest French industrial concerns for the advancement of French trade and engineering interests in this part of the world, comprising amongst its shareholders such prominent firms as the Cie de Fives Lille, French Thomson-Houston, Comptoir d'Exportation des Produits Metallurgiques, Société des Aciers de France, Hauts Fourneaux et Fondiers de Pont-a-Mousson, Société des Manufactures des Glaces et Produits Chimiques de Sant Gobain, Chauny et Cirey, Société Française d'Entreprises Industrielles et Commerciales en Chine, Société Industrielle des Telephones, Société Miniere et Metallurgique de Penaroya, Société de Constructions des Batignolles, Rocca, Tassy et de Roux, Delaunay-Belleville, Banque de l'Indo-Chine, with various other well-known French capitalists. As the outcome of an understanding with the governor-general of Indo-China, the component members of the Cie Generale d'Extreme Orient have organized under the direction of the Banque de l'Indo-Chine, the "Syndicat d'Etudes des Chemins de Fer du Sud de l'Indo-Chine" for the purpose of surveying and investigating the lines projected for the south of Indo-China by the governor-general of the colony, generally referred to as M. Sarraut's scheme. This commission has already established offices in Paris and is sending out a large surveying party to make the necessary reports.

The French have realized for many years that their colony is the link in an all through rail communication between Europe and Siam, and Singapore, shortening the distance to the East Indies and Australasia, and have directed their diplomacy towards facilitating the construction of lines that would make this feasible. The disorganization of China has prevented further progress in this direction by the construction of lines in this country until the consortium is accepted by the Chinese and the few remaining links in the through system are contracted for. With the completion of the Canton-Hankow line, there will remain only the comparatively short link between Canton, Nanning and Langson to complete the system, or, the same result would be obtained by the completion of the Siems-Cary line from Chuchow in Hunan to Yamchow in Kwangsi, which will pass through Nanning where the short connection with Langson is a comparatively minor matter. The French have been spurred into action by the extension of the Siamese southern lines to connect with the Federated Malay States system, thus making possible a great reduction in time between Europe and Bangkok. The Siamese government has also projected a line running east from the capital to the Cambodian border, where a connection with the Indo-China railways will still further shorten the distance between Saigon, Haiphong, Hanoi and Europe via Suez, and, when conditions are again normal over the trans-Siberian line, and connecting links are built in China, London and Paris would be brought within seventeen days or less with Singapore. The way things are moving, with Siam pushing her system steadily ahead and the French concentrating on their part of this general scheme, the last to swing into line will be China.

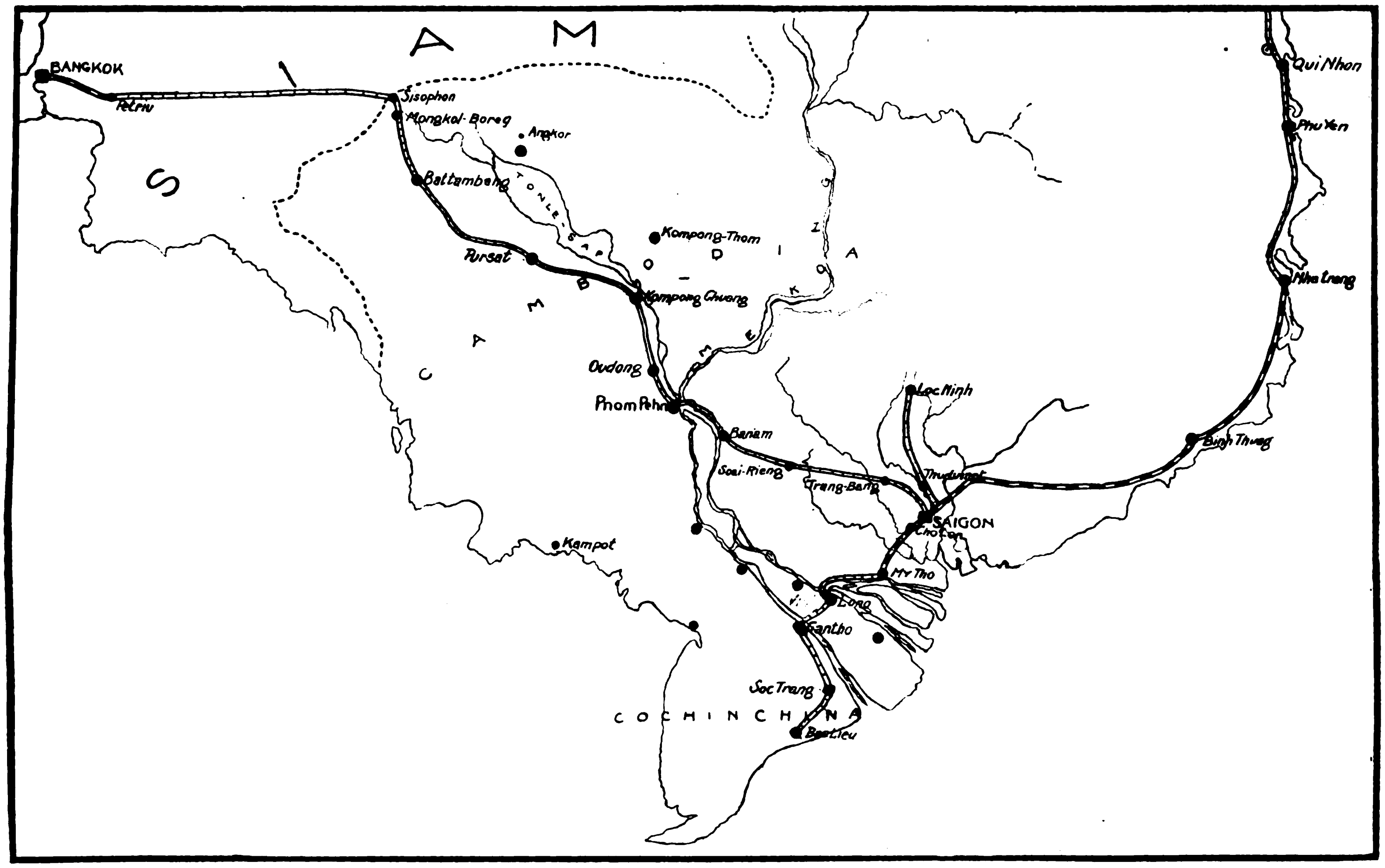
M. Albert Sarraut, Former Governor-General of Indo-China

The French end of this great scheme is simple, calling for the construction of a coast line from Nhatrang to Tourane, a distance of 530 kilometres, and another link from Saigon westwards through Phnom-Penh to Battambang and the Siamese border, a distance of 645 kilometres, or, a total of some 1,175 kilometres of new lines to link Singapore with Langson, on the Chinese border.

Probably the most important and urgent from the French view point is the southern line extending west from Saigon to the Siamese border and the extension from that point to Bangkok or the terminus of the Siamese lines at Petriu. This is the principal line in the scheme advocated by Governor-General Sarraut, and is to start from Saigon, the capital of Cochin-China, and pass through Pnom-Penh, capital of Cambodia, and thence through sparsely populated districts to Battambang and the Siamese frontier and on to Bangkok or Petriu. The section in Siamese territory, however, will only be taken in hand after the proper authority has been obtained through negotiations with the Siamese government. Through Bangkok, this line, as pointed out above, will have connections with the existing railways in the Federated Malay States, and with India, when the proposed section between Moulmein and Chengmai is completed by the Indian and Siamese authorities. This line, therefore, will not only facilitate intercourse between Indo-China, Siam, Federated Malay States and India, but open up to development the southern lake district of Tonle-Sap.

The first section of this line west from Saigon will follow the valley of the Mekong through Trang Bang, Soairieng and Banam to Pnom-Penh, crossing on its way the Great Vaico, the Small Vaico, the Kompong Trabor, the Banam and the Mekong Rivers, the width of this last being 1,200 metres with a depth of 15 metres. The second section proceeds up the Tonle-Sap valley following the river about 10 kilometres distant, instead of adhering to the old project around the north end of the lakes connecting Kompong Thom and Angkor. As the road from Pnom-Penh to Kompong Thom will be finished this year, and then extended to Angkor, it seemed preferable under the circumstances to follow the southern route which is 50 kilometres shorter and has the added advantage of connecting the important centres of Kompong-Loung, Oudong, Kompong Chuang, Battambang, Mong-Kol-Borey and Sisophon. The third section of the line passes through the valley of the Great Lakes at a slight elevation above flood level and thence up the Stung valley to the Siamese frontier.

admirable system of navigable waterways serving this district, and the high cost of building the long bridges over the various branches of the Mekong. The sudden development however of Western Cochin-China resulting from the deepening of canals for the past twenty years, has necessitated regular and economical rapid transport system in order to facilitate passenger and goods traffic between the high and low lands. In locating this line it has been difficult to connect the larger centres in a manner that harmonized with the possible sites for the more important bridge and embankment works. Three gigantic bridges would have to be constructed, one over the Mekong, 1,400 metres, over the Song-Cochien, 600 metres and another over the Bassic of 1,400 metres, in addition to 1,600 metres of secondary bridges. The Mekong Bridge alone presents a formidable engineering problem requiring pier foundations 40 metres deep. To increase the cost, the existing line between Saigon and Mytho will have to be brought up to standard working condition.



Map Showing the Projected Southern Indo-China Railways in M. Sarraut's Scheme

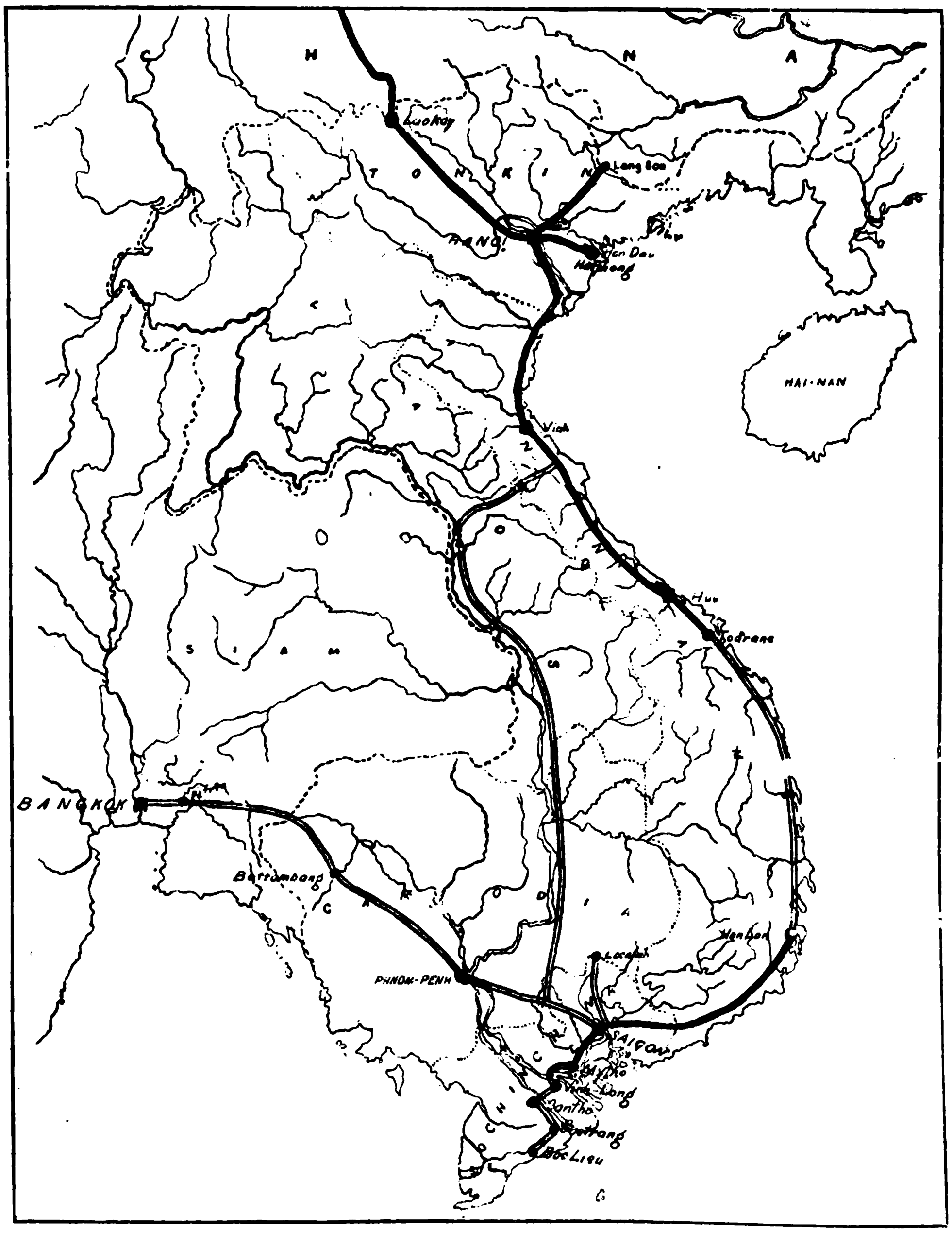
The greatest difficulty in the construction of this line arises from the low elevation of the country inundated at frequent intervals by the rise in the many rivers and requiring high embankments for at least three quarters of the entire distance. Furthermore, these conditions necessitate a large number of bridges, the longest being one over the Mekong, 1,200 metres ; the Bassac, 280 metres and the Great Vaico, 140 metres. This bridge work will greatly increase the cost of construction, that otherwise, would be comparatively cheap.

Another important line advocated by M. Sarraut for the south of Cochin-China will run across the delta from the terminus of the existing Saigon-Mytho line. For many years the business element of Saigon has been demanding the extension of the Saigon-Mytho line (69 kilometres) to Baclieu passing through the important centres of Vinh-Long, Cantho, Cairang and Soctrang. The execution of this work has always been defeated because of the

Another of the lines in M. Sarraut's scheme is one from Saigon to Locninh a distance of 125 kilometres, to tap the red lands of the Thudaumot province and contribute to developing the cultivation of rubber in that district. From this line, two others will branch off, one traversing Cambodia towards the Mekong to open up the Southern Laos, the other striking north towards Tourane through the South Annam table-lands. The Locninh line will connect with the existing Saigon Nhatrang line at Binh-Trieu station and proceed up the Saigon River district through Laithien to Thudaumot, and from here strike through the hills between the Saigon river and the Song Be passing through Xa-Trach, Hongquan to Locninh. This line is therefore one for the development of agriculture in Northern Cochin-China and Eastern Cambodia and will solve the problem of bringing labor to the districts and facilitate the opening of new lands.

In addition to these schemes for the development of South Indo-China which the engineers of the new French company are

now studying, there remains the larger and more important plan to connect the north and south of the colony by a direct line through the interior following the valley of the Mekong. The coast line which will eventually link up the two extremes of the colony now terminates at Tourane, half way down the coast. Between Tourane and Quinhon (300 kilometres) the line will traverse a cultivated and inhabited flat country cut by small hills of the Annamite chain. It presents no great engineering difficulties but necessitates a great number of bridges and fairly high embankments in the low lands of the deltas of the streams and rivers coming from the coast range. Between Quinhon and Nhatrang (230 kilometres) this line will open up Ninh-Hoa and the Tuyhoa district where an irrigation system of 17,000 hectares is to be developed but will have to pass through Mount Varella by a 1,200-metre tunnel and find its location for some distance along the abrupt slope of the granite bluffs that emerge abruptly from the sea. The minor Varella hills will require considerable cuttings, one 500 metres long, before the line reaches Nhatrang, while the Song-Darang calls for three bridges, one 150 metres long on the smaller branch, another of 600 metres for the main channel and a third of 150 metres for the Song-Bang Trach.



Railway Map of Indo-China Showing the Projected Mekong Valley Line

The difficulties of construction raised by the tunnelling of Mount Varella, taken in connection with the undeveloped condition of the districts traversed by this coast line, diverted investigation towards finding a more economical location for joining North and South Indo-China through the Annamite chain and the South Annam table-land into the valley of the Mekong and then down the incline to Saigon, opening up the rich forest lands of the interior and the famous red lands of Cambodia and Cochin-China. Politically, such a line had much to commend itself to the authorities as it facilitated extension of control over the Mois people who are still semi-independent.

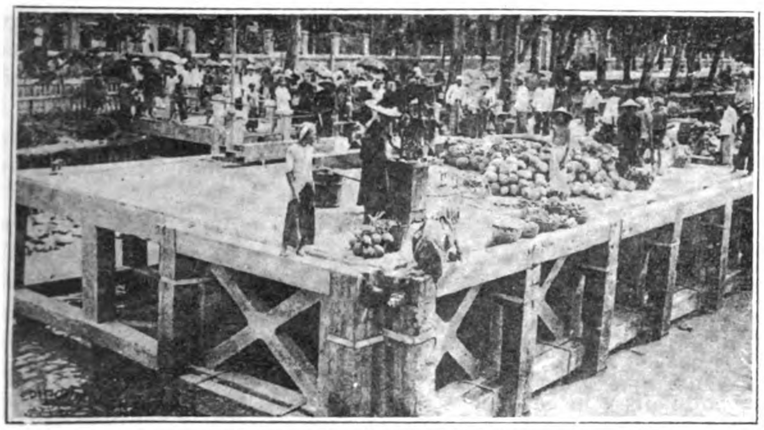
It has been urged that the Tourane-Nhatrang section of the coast line is not vitally essential, as the ports are well served by an admirable coasting service, and the motor roads now under construction will meet for a long time the needs of travelers. Naturally, the idea of suspending construction on the through coast line, in favor of the interior line, has opened up considerable discussion in Indo-China, and when the advantages of the latter are viewed from the political and strategical standpoint, it is easy to understand that it meets with the endorsement of the governor-general. Under existing conditions, the coast lines, exposed to the sea or within easy reach of a hostile landing party, constitute a military weakness. The interior line is, therefore, of the highest strategical importance for the proper defense of the colony. It is also urged in favor of this route that when the Saigon-Pnom-Penh section of the line to Siam is constructed, it will pass through Payninh, where it would join the the Mekong line, thus shortening the total distance to a point where the Mekong line would not exceed in length the uncompleted sections of the coast line. No headway will be made in the construction of these two lines until a final decision is arrived at as to whether to continue the construction of the exposed coast line or proceed with the central line which will cut across the coast range the Meu-Gia ridge and come out into the Mekong valley near Thakhek and follow down the Mekong to connect with the projected Saigon-Siam line.

These questions are being freely discussed in Indo-Chine and we find Mr. H. Cucherousset, the able editor of "*L'Eveil Economique*," strongly advocating the Mekong valley route and fortifying his arguments with maps and plans which carry conviction. While this important link in Far Eastern communications may hang fire for several years yet, there seems to be excellent prospects of the southern lines in the governor-general's scheme being realized. Here, the determining factor is the excessive costs of enormous bridge work, offset to some extent by the extremely low cost of labor for general construction. Past experiences have taught the French railway engineers to be cautious in their estimates for construction in the interior districts, especially in the deep valleys of the Mekong and other rivers that flow down from the Himalayas. The construction costs of the Yunnan Railway jumped to almost prohibitive prices because of the great mortality of the laborers, who sickened and died like flies from the miasma that came from the rivers and the breaking of new ground. For instance, the Haiphong-Yunnan line with a total length of 853 kilometres (386 km. in Tonkin and 467 in Yunnan) cost 237,047,000 francs, of which 71,580,000 francs is charged against the Tonkin section and 165,466,000 to the Yunnan section, or about 185,000 francs per kilometre in Tonkin and 354,000 francs per kilometre in Yunnan, approximately twice as much as

Rail Depot along the Line of the Coast Railway in Indo-China

the section in Tonkin. In the colony proper, the most expensive line was the one from Hanoi to Namquan (167 km.) which cost to construct 41,034,000 francs, or 245,000 francs per kilometre. The line from Hanoi down the coast to Vinh (Benthuy) 326 kilometres cost 134,000 francs per kilometre.

Reverting to the Mekong Valley route advocated by Mr. Henri Cucherousset, he argues that the north Annam port of Vinh or Benthuy will become the logical terminus of the through China-



The Landing Stage at Vinh-Long

Bangkok-Straits line by reason of the shorter time consumed in direct steamship navigation between this port and Hongkong or Canton over railway journey around the gulf of Tonkin.

"Benthuy," he says, "is 300 km. south of Haiphong and north of the great bulge formed by the coast of Annam, is situated on the river Ca, near the important town of Vinh. It can only give access to ships under 1,500 tons drawing no more than 12 feet. Although it taps two provinces with a population of 1,500,000 inhabitants and has large industries, especially the meat freezing and packing firm of P. A. Lapicque & Co., the building of which has cost 800,000 dollars, it is not proposed to do more than make the access a little easier to 1,000 tons steamers especially constructed for a regular fast passenger service with Hongkong. For the rest the present sea launches and lighters towed to the Bay d'Along or Haiphong will suffice. Benthuy is connected by rail with Hanoi and Haiphong but direct steamship line from Hongkong would save 14 hours railway journey whilst the sea journey would only be five or six hours longer than from Hongkong to Haiphong.

"Therefore Benthuy must be for Hongkong and Canton the head of the line to Bangkok. The distance from Benthuy to Bangkok would be about 1,000 kilometres ; from Hanoi 1,325 ; and from Haiphong 1,427.

"The railway is under construction south of Benthuy and will join the existing railway of Tourane to Hue and Dongha. It follows the coast and will be eventually continued down south until it meets the 410 km. long railway from Saigon.

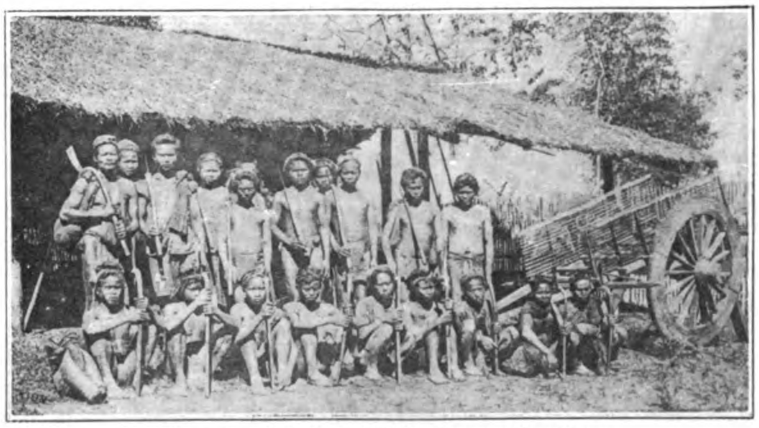
"On leaving Vinh-Benthuy the proposed Mekong Valley line railway follows the rich and beautiful valley of the Ngan Sau river ; from that valley it passes to another which comes from Laos and runs southwards to the sea near Dong Hoi. The upper part of that second valley makes a deep cut through the Annamite Range and leads to a pass, the Meu Gia pass, which is one of lowest in that enormous and prohibitive chain of mountains. Through that upper valley and the Meu Gia pass a railway detached at Tan Ap from the coast railway could be easily constructed.

"Now from the Meu Gia pass the route to be followed depended entirely on Siam's railway policy. If the old plan of a railway from Korat to Roi-ed, with two branches, one from Roi-ed to Nongkhay and the other from Roi-ed to Nakon Panom had been followed, it is evident that after leaving the Meu Gia pass the French railway would have reached the Mekong by the shortest way, at Thakhet, opposite Nakon Panom. The distance from Thakhet to Tan Ap would have been about 190 km. or 280 from Benthuy.

"But Siam has decided to continue the Khorat railway toward Oubone, which is 300 km. south of Lakon Panom. It is, therefore, Oubone that the French railway must reach after passing the Annamite range. This is much more to the advantage of the French colony than the other solution as a line joining Meu Gia to Oubone would cross the Mekong at the Keng Yapeut, south of Kemmarat, thus keeping longer on French territory through the rich province of Savannakhet. The choice of Yapeut instead of

Government House at Cantho

Kemmarat for crossing the Mekong is caused by the necessity to meet a navigable stretch of the river. Savannakhet would be too far north and too much west of of the direct line. South of Yapeut, that is to say of the notorious Kemmarat rapids, there is a long stretch of navigable water extending for the whole length of the Bassac province, a province which already exports a large quantity of rice, thus giving the lie to the legend that the Lao people will only cultivate what is strictly necessary for their food. In times like the present, when precisely at the low water season there is a



Plantation Workers in Thu'daumot Province

Mois on their Way to the Coast to Barter

Coolies Repairing a Dyke

dearth of rice in Siam, the exportation of Bassac rice, practically impossible by the Mekong, would then be diverted to Siam.

"The total length of the proposed railway, from Oubone, the terminus of the railway now under construction by Siam, to Tan Ap where the line would branch from the French coastal railway would be about 460 km. of which 370 would be on French and 90 on Siamese territory.

"The only difficulties would be on the first eighty kilometres on the French side where a lot of tunnelling and small bridges would be necessary; and then bridging of the large rivers Se Ban Bangfai, Mekong and Se Mool. The difficulties near the Meu Gia pass, however, would be nothing compared with those the French engineers so successfully overcame in Yunnan, and the bridging of the Sebangfai and Se Mool would be made in the dry season when the greater part of the work would be in dry ground. As for the Mekong it is the easiest river in the world to bridge, as at very frequent intervals there are across the bed of the river gigantic barrages of enormous rocks which appear at the low water season leaving only a number of narrow channels. So no foundations would have to be made under the water or in bad ground; it would only be a question of how many tons of steel. Would the railway be a paying proposition?"

"There can be no doubt about it. Not only would it help to develop very rich districts where rice, tobacco and cotton can be cultivated and cattle bred in large numbers with beautiful forests of easy access from the proposed railway and several copper and tin mines, but it would bring to the port of Benthuy and secure for Bangkok a large part of the Mekong trade. That can now, with very poor communications and a population which has nothing to incite it to work, he estimated at 80,000 tons. It would soon be trebled as the Lao population would be encouraged by the new facilities to dispose of their products and receive at reasonable price manufactured goods, and as there would be soon a great movement of immigration from Tonkin. The Tonkinese who are overcrowded in their delta, are active and willingly emigrate when easy communications leave them the possibility of going back home at any time. Already they come in large numbers along the Mekong in spite of enormous difficulties and the Annamite population of Vientiane for instance passed from 1,200 to 6,000 between 1914 and 1920.

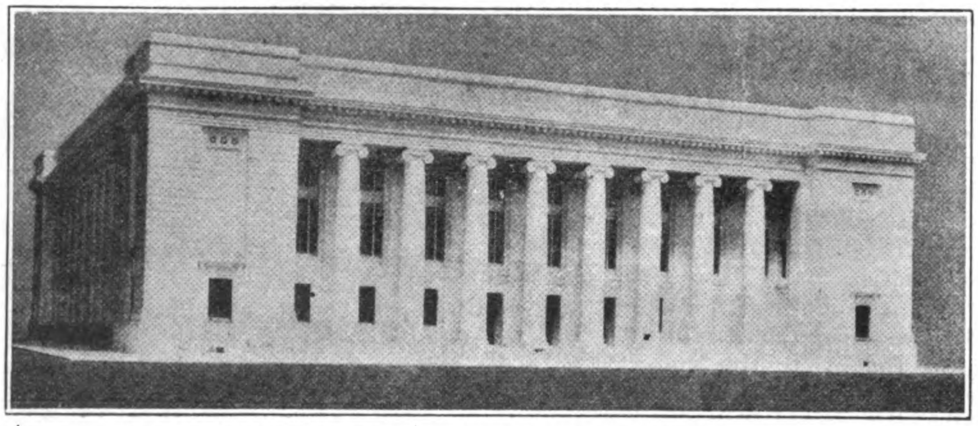
"The railway would also be used by the Tonkinese emigrating to Cambodia and North Cochin-China where already thousands are employed on the rubber plantations.

"Then as an international railway the proposed line would be of immense value. Bangkok would cease to be an out-of-the-way place to become the centre of a new system of communications and many of the travelers from Hongkong to Siam would close that way.

"I consider that this is one of the finest propositions that can be laid before the capitalists of the Far East, and that it should not be difficult to raise the necessary capital on the spot, that is to say between Bangkok, Singapore, Saigon, Haiphong and Hongkong. The cost would probably average 50,000 ticals a kilometre or about 20,000,000 ticals as it is probable that the Siamese state railways will build their part of the line up to the Mekong on the resources of the Siamese budget."

The New Mitsubishi Bank Building

ONE of the handsomest buildings this side of Suez, designed by Dr. Kotaro Sakurai the noted Japanese architect, has just been completed for the home of the Mitsubishi Bank opposite the Municipal Hall in Tokio. It is pure Grecian Ionic in outline similar to the United States Treasury, with a row of eight massive stone columns on the facade. The dimensions of the building are about 200 by 180 feet. The framework is of steel imported from the United States. The feature of the main floor, the huge banking room, will be 70 feet wide by 140 feet long and 45 feet high, finished in terracotta imported from America, with floors of Italian marble. Massive bronze doors, bronze railings and counter screens were also imported from America. The vaults and doors came from England. The building is equipped with three elevators. The construction of the building which was carried out under the supervision of the architect by the Mitsubishi estate department has cost about Y.3,000,000.



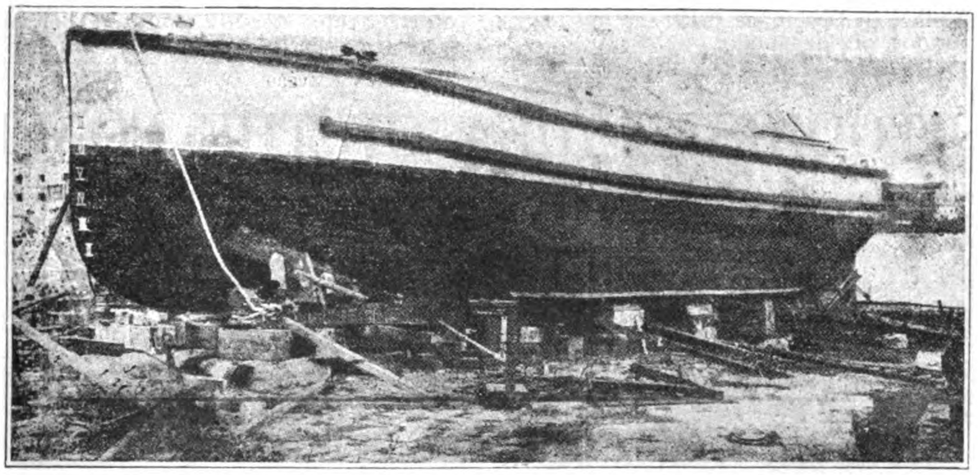
The New Mitsubishi Bank Building at Tokio

Reinforced Concrete Ships in the Orient

WITHIN the last few years, not only river barges, but cargo-boats of several thousand tons burden, have been successfully built of reinforced concrete, and have proved by their general seaworthiness, their right to a place in the front rank side by side with steel or wooden vessels. Such ships are now being built regularly in England and the United States as well as in other countries where steel is even more expensive.

The war brought to the notice of those interested, the fact that reinforced concrete has the same qualities essential to shipbuilding as timber or steel, viz.—strength, water-tightness and—in spite of a widespread impression to the contrary—elasticity. To this latter quality any contractor who has handled long piles, or made tests on reinforced concrete floors or bridges will testify, when the test load is removed the deflection disappears, and the structure perfectly elastic, returns to its original form.

In 1915 it became necessary to replace the vessels sunk by German torpedoes, and rapid construction was essential. Steel was becoming scarce and expensive. Timber was first thought of and as stocks of seasoned timber were getting very low, American forests were felled and turned, all too quickly, into large vessels. The check received by this timber fleet is common knowledge. On second thought reinforced concrete was adopted with complete success. The constructional problems presented were successfully met, and experience has proved the ample constructional strength of ships built of this material.



Concrete Barge built at the Hongkong Works of Brossard-Mopin

Reinforced concrete vessels show two advantageous qualities; in addition to being good sea boats and behaving admirably in heavy weather, their vibration is much less than in steel boats, and the period of roll much longer. No leakages have been reported, but a few fine cracks in the shell and bulkheads of ships in service have been noticed. These cracks proved unimportant and have no effect on the structural strength of the ship. These vessels however require more adequate fendering than steel boats.

Experience shows that severe concentrated blows on the shell, such as would only indent the steel plates, tend to shatter the concrete around the point of impact. Adequate fenders would permit the absorption of such shocks by a resitient material and obviate this disadvantage. These remarks apply particularly to barges. It has been found, however, that repairs are relatively simple in such cases, and can be effected by any handy man with little loss of time and at a slight expense, which is more than compensated by the elimination of the heavy maintenance charges for a steel vessel occasioned by the continual fight with rust.

The rapidity of construction of reinforced concrete ships is practically independent of size, as the number of workmen employed at the same time is proportional to the volume of concrete in the structure, which volume is in turn proportional to the tonnage of the vessel. The time of construction for a yard with ordinary equipment varies from five to six months for the hull. The fitting out of a reinforced concrete vessel requires the same time as for a steel one. A comparison of a steel and a concrete vessel of the same deadweight carrying capacity reveals the fact that the concrete ship, on account of the greater weight of the hull, must have greater dimensions than the steel ship, and in consequence, greater hold spaces. For heavy cargoes, such as coal, ore, oil and steel billets, as the deadweight capacity will be reached in both cases before the holds are filled, the steel ship has an advantage over concrete as the material of construction, other factors being equal.—For light cargoes, on the contrary, the increased hold volume of the concrete vessel reverses the position—the steel vessel being filled before its full deadweight capacity is reached.

In the design of a steel ship straight lines are adopted as far as possible, whereas for the concrete vessel long, sweeping curves are desirable for economical construction. A concrete ship will hence have finer lines than an equivalent steel vessel, thus offsetting again, by a diminished resistance to propulsion, the increased operating charges caused by greater displacement. The employment of reinforced concrete has, in addition to its usual advantages, special interest in the Orient; the bulk of the labor required, as has been amply demonstrated in the construction of ships already launched, need not be especially skilled, and is thus easily obtained, the majority of the materials required are available on the spot and of excellent quality; rapid construction is easy where labor is plentiful and cheap.

In the Far East the Etablissement Brossard, Mopin, Contractors, the pioneers of reinforced concrete ships on this side of the world, have successfully launched several such; details of three typical examples are given below:

1. *Barges Launched Six Years Ago at Saigon.*—These barges were employed as pontoons carrying steam driven pile drivers without showing any trace of damage resulting from the severe shocks to which they were subjected, and are still employed for the transport of materials for public works, and as house-boats, sheltering the firm's agents in the vicinity of works in progress in the bush.

2. *Ferry-boat Built at Singapore* to carry wagons of the Federated Malay States railways across the narrows to Johore. This boat, ordered on account of the impossibility of obtaining the steel necessary to replace the existing ferries, was built to a similar specification in five months' time to the following dimensions: Length, 127-ft.; width, 27-ft.; moulded depth, 7-ft. 6-in. The load carried is approximately 150 tons, and for the last three years this ferry has made several trips a day carrying six goods wagons from the island to the continent without showing any sign of fatigue or damage, and remains perfectly water-tight.

3. *Cargo Boat—" Cochin-chine."*—Externally the hull has exactly the same lines as a steel or a timber hull, its curves having been determined in the same manner as such hulls. The following are the general dimensions of this ship: Length between perpendiculars, 269-ft.; moulded width, 38-ft.; moulded depth 24-ft. 6-in.; average loaded draught, 19-ft.; corresponding displacement. 4,500 tons; draught empty, 11-ft.; oil tanks (combustible) and fresh water, 240 tons; provisions and various supplies, 24 tons; cargo, 2,000 tons; volume of the four holds, 37,000 cu. ft.; horsepower, 1,000; number of screws, 2; speed, 10.4 knots.

Internally the hull is built on a special honeycomb system of great strength, combined with minimum weight. The main frames

are formed by joining up the bottom, side and deck beams. The construction on this system of such a vessel as the *Cochin-chine* demands of the workmen, skill, handiness and patience, such as are the special attributes of Far Eastern races, and it is for this reason that the constructors, experts in reinforced concrete work, having already successfully launched several barges and a ferry-boat, had no hesitation in undertaking a construction of such importance.

ENGINES—The twin screws are driven by two Diesel engines of 500 hp. each, having six cylinders, and turning at 187 R.P.M., built by Messrs. McIntosh & Seymour at Auburn (New York). These engines gave an officially recorded speed of 10.4 knots at the trials. Their consumption is 0.955-lb. of oil per horse-power hour, and as the tanks have a capacity of 240 tons of oil, the vessel can be navigated during 40 days without replenishing. As this vessel was built during the war, the shortage of materials forced the builders to utilize engines, and above all fittings such as could be obtained, and far in excess of the strength required for such a ship. For this reason certain figures given above are somewhat unusual; some 150 tons of carrying capacity being lost in this way.

The *Chinchine* which was built under the supervision of the bureau veitas, is classed by that corporation I. 3/3. G. 1. 1. and is insured under similar conditions to steel or wooden vessels. Since her trials, which took place in December 1919, she has maintained a regular service between Singapore, Saigon and Haiphong and in March 1920, transported two military contingents of 500 to 600 men, each from Saigon to Haiphong in addition to her cargo.

This vessel has proved altogether seaworthy, and on account of the large diameter of her screws, manœuvres very easily and can be brought to a standstill in her own length. The hull of the *Cochin-chine* described above contains 1,200 tons of concrete reinforced with 300 tons of steel. An equivalent steel ship would require some 1,300 tons of steel sections and plates. The difference in weight is not very considerable. On substracting the weight of steel bars in either case there remains 1,200 tons of concrete as against 1,000 tons of steel, which latter would obviously cost far more than 1,200 tons of concrete, in fact the concrete hull would cost at the time of writing some 50 to 60 per cent. less than the steel one.—A very remarkable difference.

The most interesting application of reinforced concrete in the Far East at the present time is undoubtedly to the construction of coasting steamers and boats for river traffic. The development of this trade provides a very interesting investment, especially in view of the present situation with regard to shipping. Overseas freightage rates are falling rapidly and many vessels are immobilized, whereas, on the contrary, a fact worthy of attention, coastal and river rates steadily maintain their high level.

THE CARTOONISTS' IDEA OF THE CONFERENCE

DISSOLVING THE PARTNERSHIP
By Rollin in the New York *World*

MAYBE THEY WILL STAY RIGHT THERE
By Walker in the New York *Call*

THAT'S NOT THE WAY TO REDUCE
The Philadelphia *North American*

"WATCH YOUR STEP"
By Window McCAY in *The American*

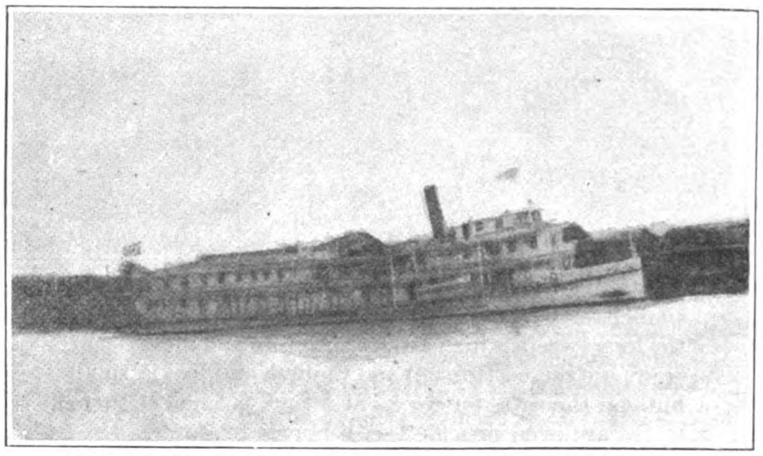
IN HIS OWN KITCHEN TOO!
By Rollin in the New York *World*

THE OPEN DOOR
By Marcus in the New York *Times*

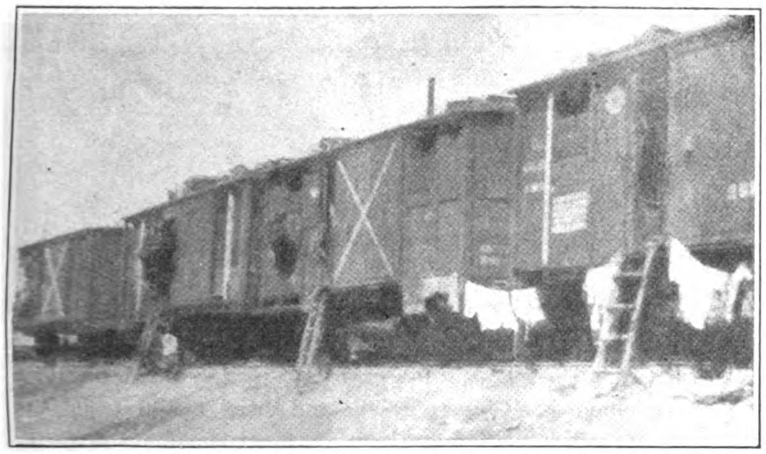
Re-birth of Industry and Commerce in Eastern Siberia

By Orrin Keith

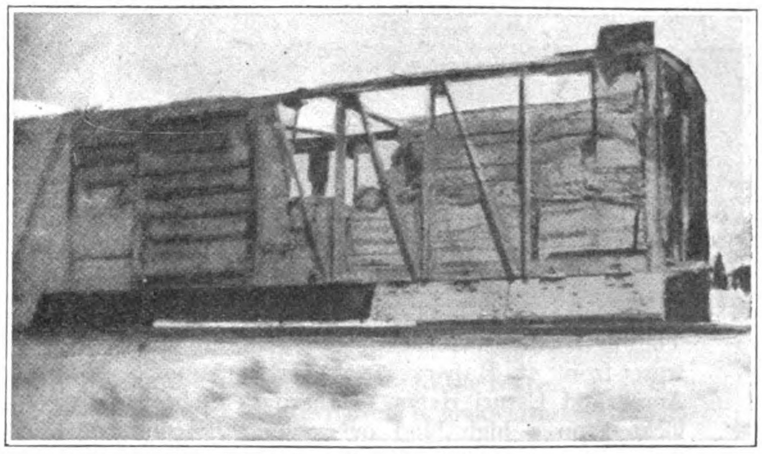
The central fact in the life of the citizens of the Far Eastern Republic is the railroad. Fortunately revolution and civil war, while they destroyed most of the bridges, left nearly all the stations intact. This is the station at Khilok.



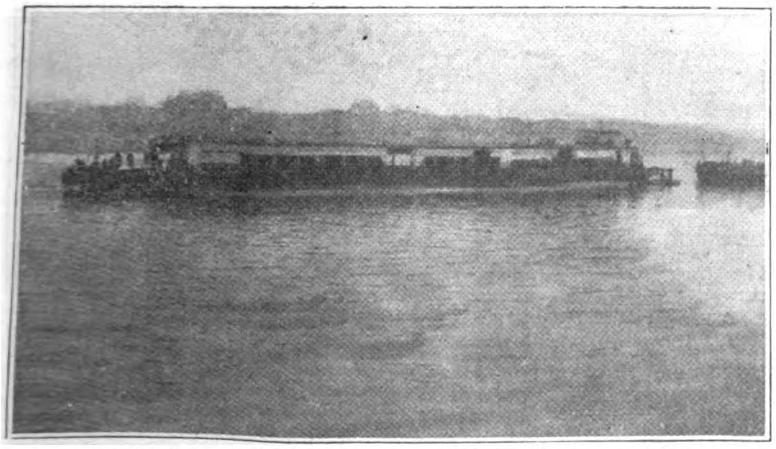
The burden on the railroad is relieved during the summer by steamers on the long navigable rivers of Siberia. Regular service connects the river ports from Stretensk to Nikolaievsk and from Blagoveschensk up the Sungari to Harbin.



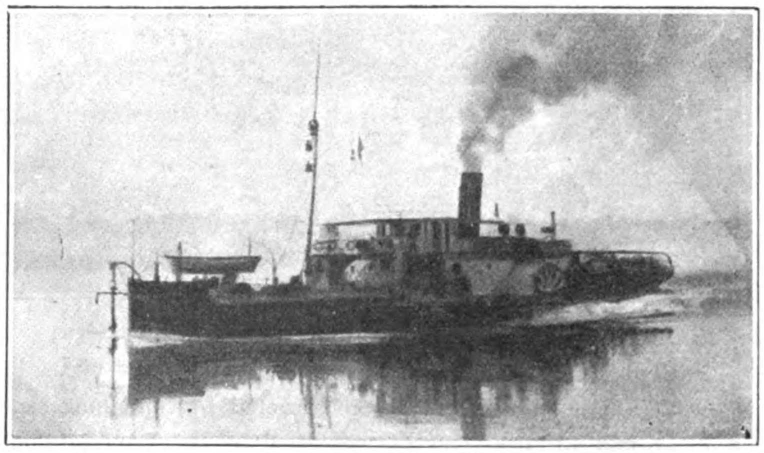
Another reason why cars are short is that many of them are standing on sidetracks and being used as houses. These are near Chita. There are many more at other places particularly at Grodekovo, where they have served as barracks for Kappelists and Semenov troops.



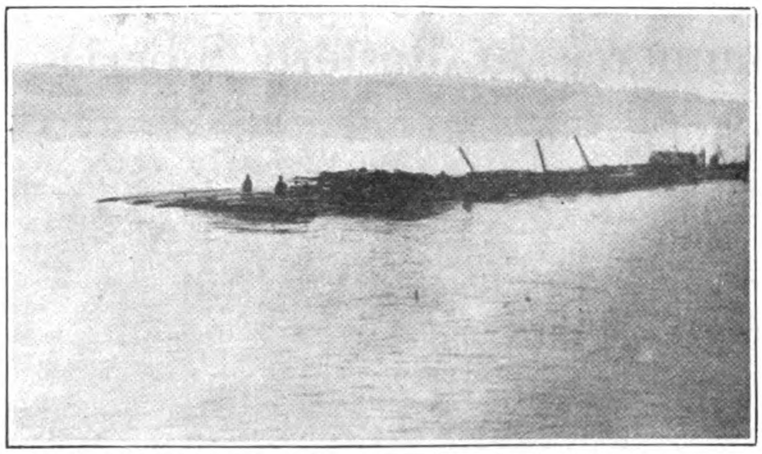
Destruction was not confined to bridges, but thousands of cars were wholly destroyed or rendered useless. This is an armored car of the Semenov troops. A six-inch wall of concrete was built inside the regular walls of the car. It was destroyed in an attack by the Siberians.



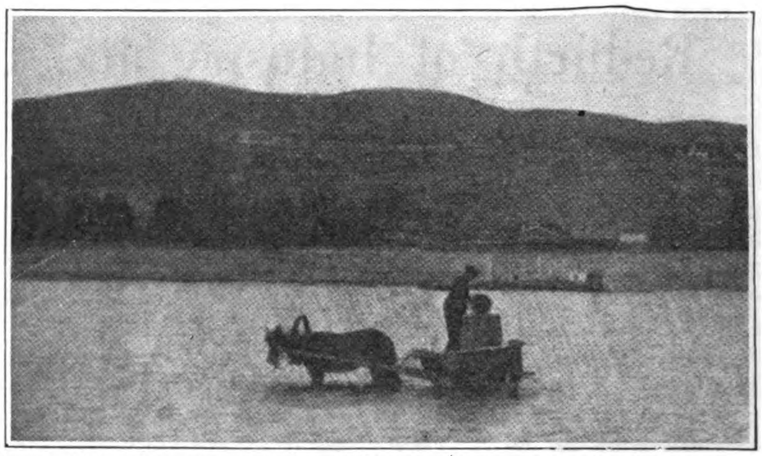
Freight is handled on the rivers in huge barges. Their great beam and shallow draft render them less liable to delay by grounding on the shifting sands of the river bottoms. A single barge can carry a tremendous load.



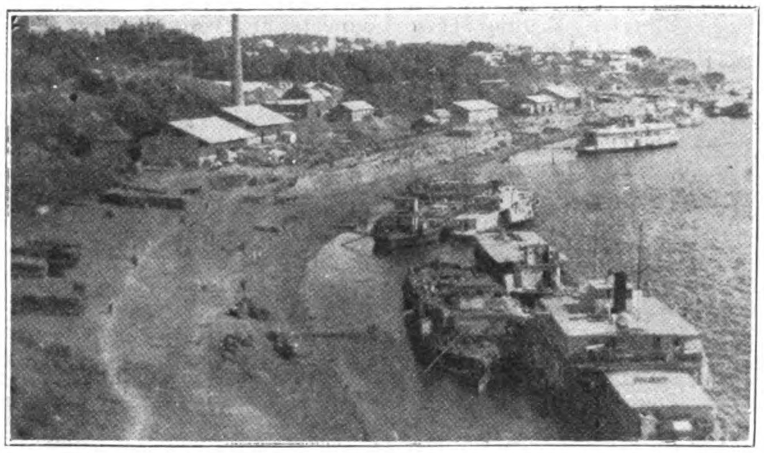
Barges are drawn, sometimes in strings of two or three, by powerful, side-wheel, shallow-draft tugboats. The fuel used is wood and, as the tugs are all engine, they consume a vast quantity in a day's work.



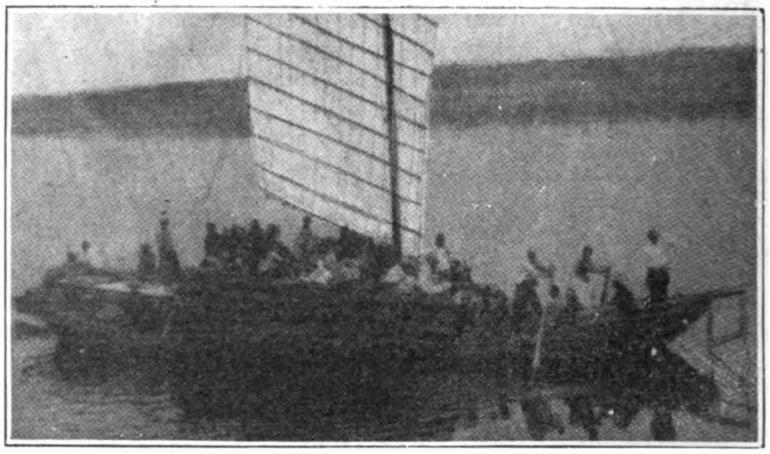
Another type of craft uses cheaper fuel. The huge timber rafts float down the stream, controlled only by the long sweeps which are set both fore and aft. Their crews are mixed Russian and Chinese and live in small huts on the rafts for weeks at a time. Some of them are even provided with horses or cows.



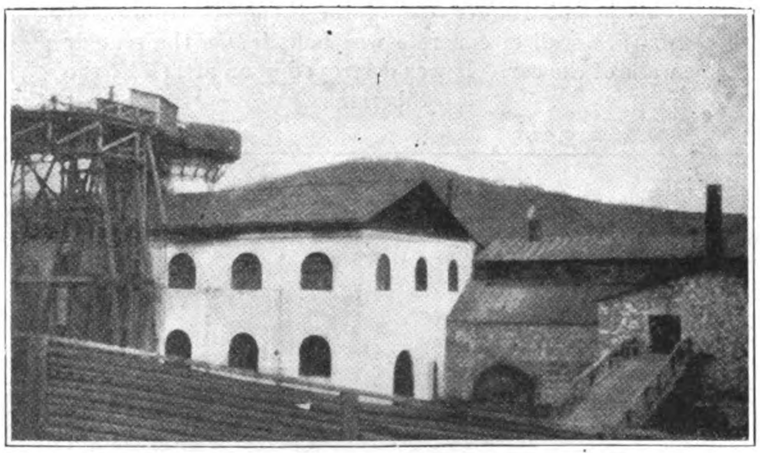
The city waterworks of Stretensk consists of a large number of these carts. They drive into the river, the barrel is refilled, and house to house delivery is made. Running water, in a Siberian city, means a steam pipe alongside of every water-pipe to keep it from freezing for seven months of the year.



The big Russian passenger steamers tie up along the water-front at Habarovsk at the junction of the Amur and Ussuri rivers. Habarovsk is beautifully located on a high bluff overlooking the confluence of the two rivers.

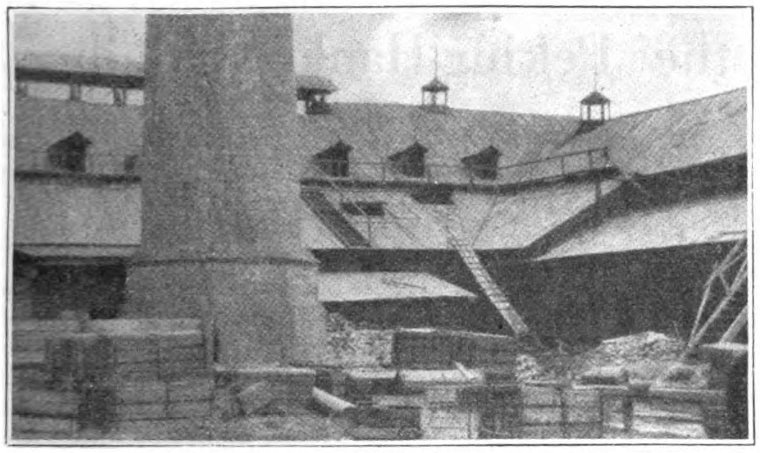


Another freight carrier frequently seen on the Amur River is the Chinese junk. Opposite every Russian settlement is a Chinese village and there is a constant exchange of products between them.

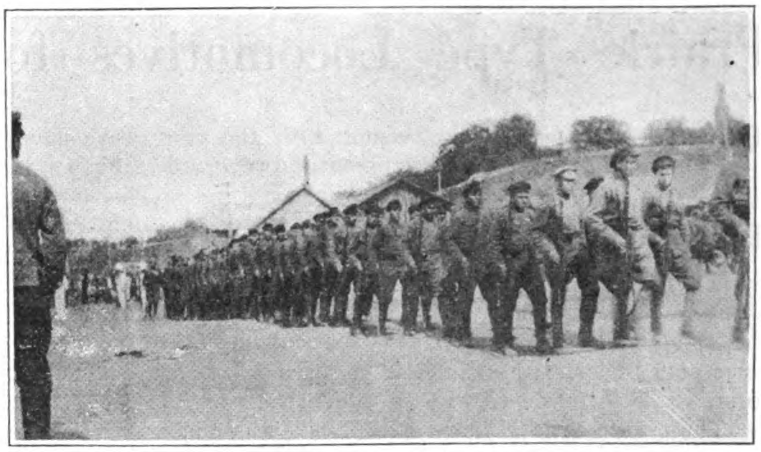


The most famous iron-works in the Far Eastern Republic is Petrovskoe-Zavod, between Chita and Verkhne-Udinsk. It was constructed by, and long worked by, prisoners, for the benefit of the Imperial purse. It was shut down during the war, but has been re-opened by the Trans-Baikal Co-operative Society, which is making many improvements.

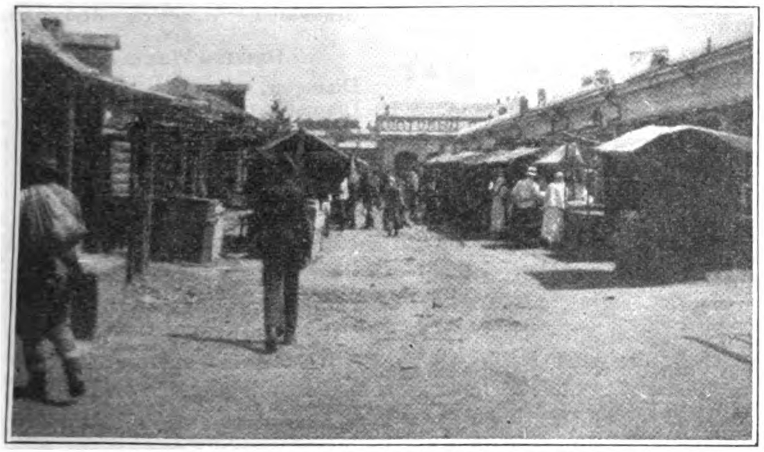
The greatest drawback to industry at Petrovskoe-Zavod as well as at other plants demanding a high fuel consumption is the lack of coal. There is not enough coal being produced now to fully meet the railroad requirements and other industries must use wood. The only smelting coal in the territory of the Republic is in the Maritime Province and is now in the hands of the Japanese. This is the woodpile of a Siberian factory. It covers 6 or 8 acres.



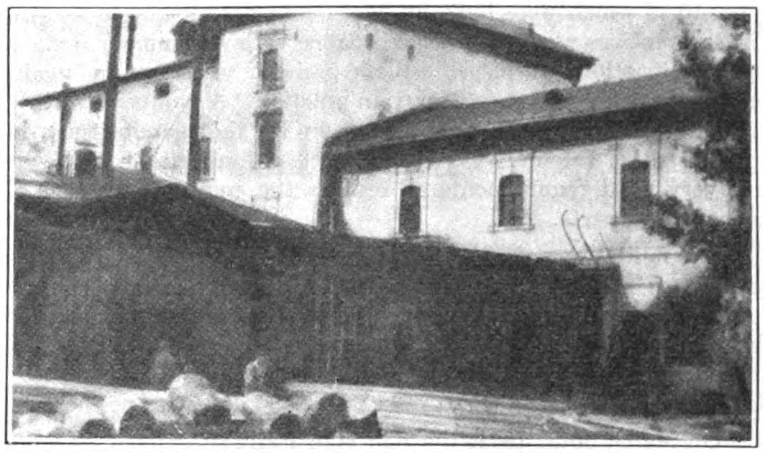
In spite of this handicap, the Co-operative Societies have renewed production in the glass works at Verkhne-Udinsk and the output is nearly as large as before the war. Window-glass, tableware, bottles and all sorts of containers are made here.



The necessity of keeping a large standing army under arms to defend the country against further raids by the bands of Ungern or Semenov has delayed the re-establishment of industry. This is a company of the Peoples' Army.



Trade, too, is making its re-beginnings on a small scale. There is no "Big Business" in eastern Siberia as yet. The peri-patetic Chinese merchant is the chief operator. He is bringing to the Siberians and selling in the bazaars, of which there is one in every city, the piece goods and small manufactured articles they so sorely need.



Necessarily the first shops to begin work after the civil war were the railway repair shops. The large shops at Chita and Habarovsk are now running and slowly repairing the destruction done to the roads. That is, when they are not turned aside to make armored trains or repair field-guns for the army.

CONFERENCE CARTOONS

THE COLOSSUS OF THE EAST MUST HAVE STANDING ROOM
By Knott, in the *News* (Dallas, Texas)

WHY NOT DISPOSE OF HIM NOW, BEFORE HE GROWS BIGGER?
By Perry, in the *Oregonian* (Portland, Ore.)

WILL HE CROWD "ARMAMENT" OFF THE BENCH?
By Henry, in the *News-Press* (St. Joseph, Mo.)

Prairie Type Locomotives for the Peking-Hankow Railway

DURING 1921, in keeping with the progressive policy of the Chinese government railways orders have been placed for more than 120 locomotives. This number is probably equal to, or more than, the number that had been purchased in any two previous years in China's history. Of this number the Kin Han Railway will receive 60 prairie type locomotives, 30 of which were ordered direct from The Baldwin Locomotive Works, the balance from the Societe Belge pour l'Exportation Industrielle through the Chinese banking group.

The prairie type of locomotive (2-6-2) was first evolved in the United States for use by the Chicago Burlington & Quincy railroad in 1900 and was used for hauling live-stock quickly across the great prairies in the western part of the country. It has a two-wheel front truck, six coupled driving wheels and a two-wheel trailing truck and is a natural development from the Mogul (2-6-0) type.

In 1919 the Kin Han Railway ordered 30 locomotives of this type, 10 of which were built by The Baldwin Locomotive Works. The locomotives were built in accordance with preliminary designs and specifications furnished by the railway with certain modifications which conform to American practice. A number of rather difficult problems were successfully met by the manufacturer in building these locomotives, including close limitations of weight and very rigid requirements as regards the counter-balancing of reciprocating parts.

The limitations of weight made it necessary to design all parts as light as possible, consistent with the desired strength and, to conform to the railway's specification, only about 46 per cent. of the reciprocating weights were balanced in the driving wheels, in order to keep the dynamic augment or increase in rail pressure, down to 15 per cent. of the static load at 60 kilometres per hour.

On March 30th, 1921, the Kin Han Railway ordered 30 more prairie type locomotives from the Baldwin Locomotive Works. The terms of the contract stipulated that 15 of the locomotives were to be delivered in China in 5½ months and the balance in 6½ months after the signing of the contract. These locomotives were completed and the entire 30 shipped from America on June 11th, 1921, arrived in China and were on the railway wharf near Hankow on September 4th, just five months and five days after the contract was signed, and on November 4th the entire 30 had been re-erected at the railway's shops at Kilometre 10, near Hankow.

A rather unique feature of these 30 locomotives is that they are equipped with copper firebox and combustion chamber. It is believed that these are the first locomotives so equipped, but we would be pleased to hear from our readers on this point if it appears to be incorrect.

Other features of the locomotives include American type bar frames, superheaters, Walschaerts valve gear, Westinghouse air brakes and steam heat Nathan simplex injectors, Nathan five-feed lubricators, Coale safety valves, 18-in. round case headlights fitted with Pyle national incandescent electric equipment, Janney M.C.B. automatic couplers and Haessler speed recorders.

The specifications for the locomotives which are being used equally well for passenger or freight service are as follows:

Gauge	4′ 8½″
Cylinders	20″ x 26″
Valves	Piston 10″ dia.

BOILER

Type	Conical
Diameter	60″
Thickness of barrel sheets...	9/16″ & 5/8″
Working pressure	170-lbs.
Fuel	Semi-Bitum. coal

FIREBOX

Material	Copper
Staying	Radial
Length	83⅞″
Width	54″
Depth, front	67½″
Depth, back...	54″

WATER SPACE

Front	4″
Sides	3″
Back	3½″

TUBES

Diameter 5⅜″	2″
Material, Steel... ...	Steel
Thickness No. 9 W.G.	No. 12 W.G.
Number 21	130
Length 14′ 7½″... ...	14′ 7½″

HEATING SURFACE

Firebox	127 sq. ft.
Combustion chamber	56 sq. ft.
Tubes	990 sq. ft.
Flues	430 sq. ft.
Fire brick tubes ...	15 sq. ft.
Total	1,618 sq. ft.
Superheater	371 sq. ft.
Grate area	31.5 sq. ft.

DRIVING WHEELS

Diameter, outside ...	59″
Diameter, centre ...	53½″
Journals, main ...	8½″ x 11″
Journals, others ...	8½″ x 11″

ENGINE TRUCK WHEELS

Diameter, front ...	33½″
Journals	6″ x 12″
Diameter, back ...	39⅜″
Journals	7″ x 12″

WHEEL BASE

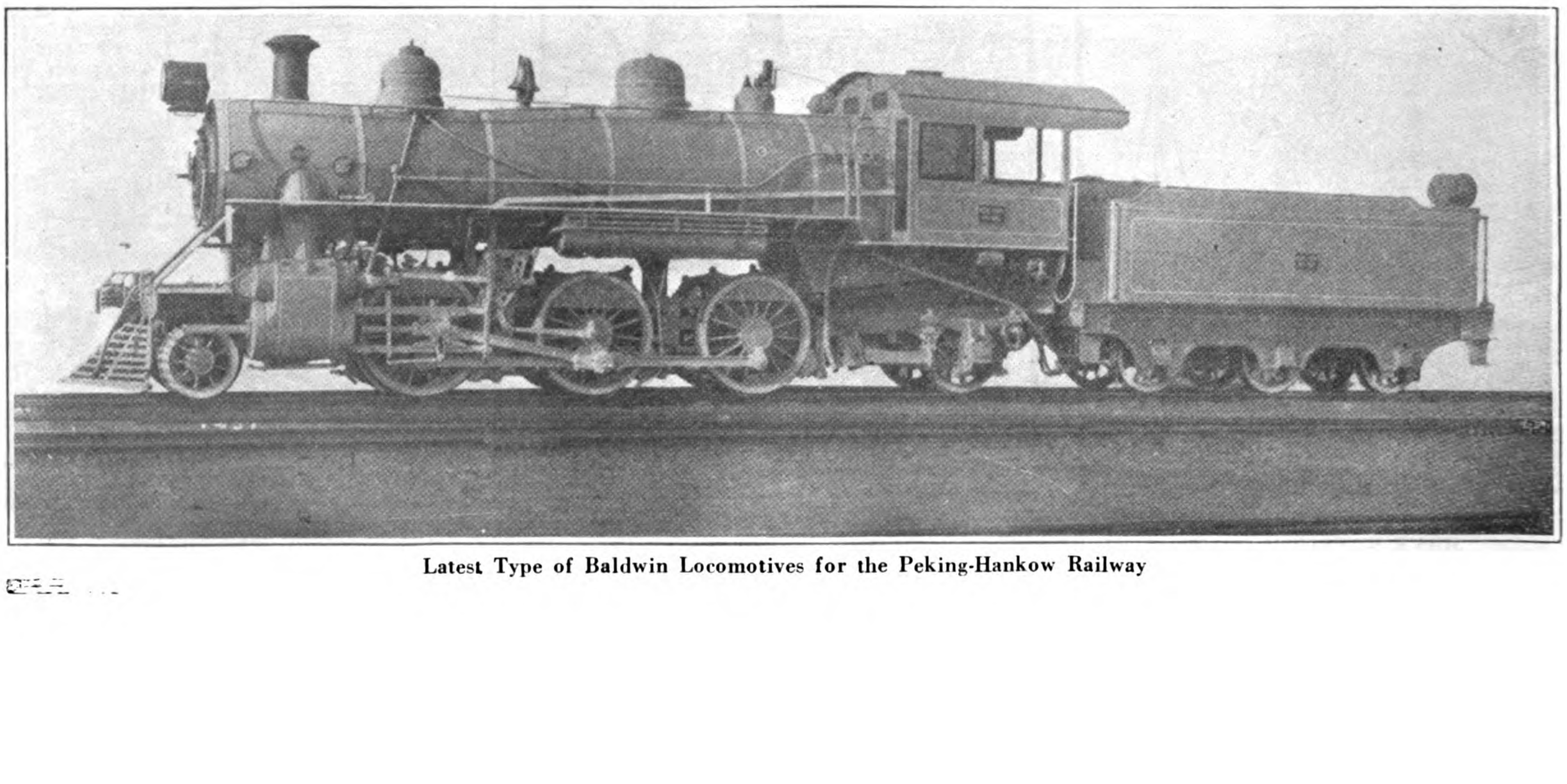
Driving	13′ 10″
Rigid	13′ 10″
Total engine	31′ 7″
Total engine and tender	53′ 10¼″

WEIGHT

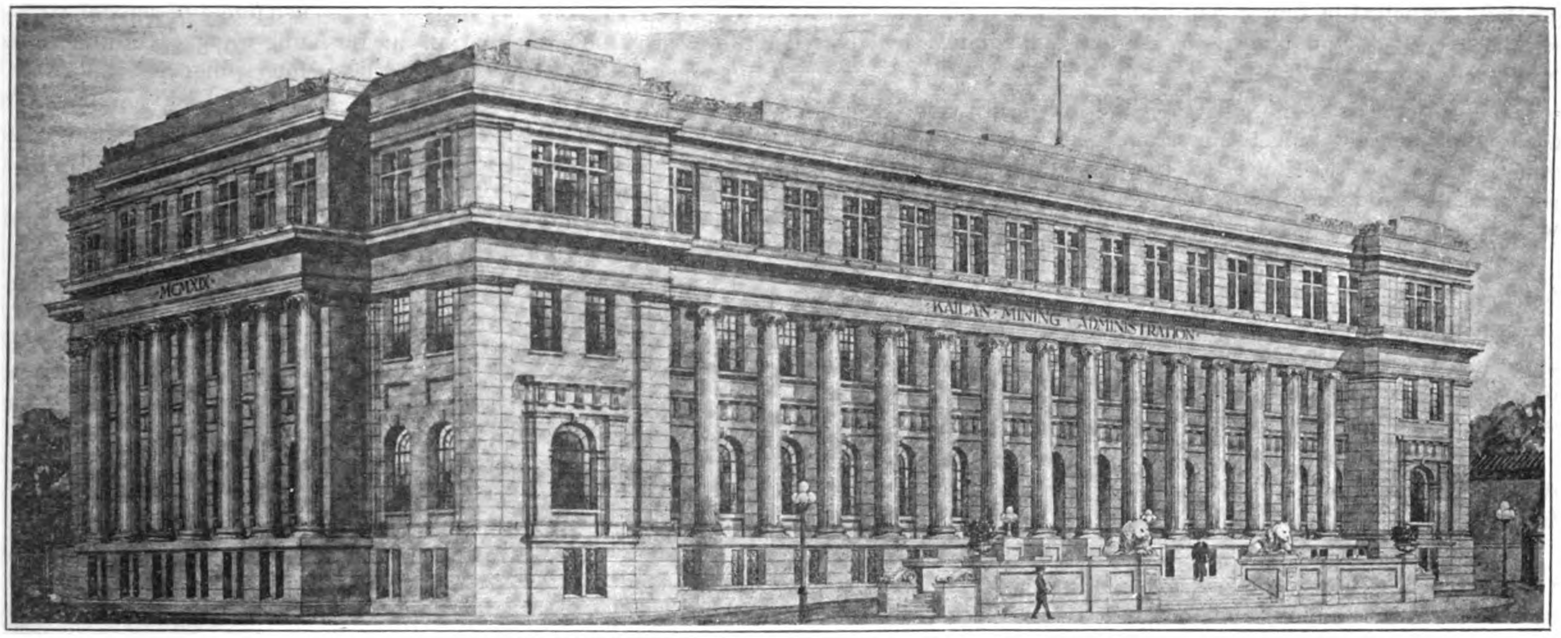
On driving wheels ...	99,000-lbs.
On truck, front ...	25,000 ,,
On truck, back ...	31,000 ,,
Total engine	155,000 ,,
Total engine and tender	247,500 ,,

TENDER

Wheels, number	6″
Wheels, diameter	39⅜″
Journals	5.11″ x 10.23″
Tank capacity	4,800 U.S. gals.
Fuel	7 tons
Tractive force at 85% of working pressure	25,500-lbs.
Service ...	Passenger and Freight.



Latest Type of Baldwin Locomotives for the Peking-Hankow Railway



New Kailan Administration Building at Tientsin

The New Kailan Building

THE new headquarters of the Kailan Mining Administration at Tientsin now nearing completion, is one of the finest examples of foreign architecture in China. It was designed by Mr. B. C. G. Burnett, the Tientsin representative of the well-known firm of Atkinson & Dallas, Ltd., in competition with several other architects. The contract for the erection has been carried out by Mr. Hong Mowkee, a prominent Chinese builder of Shanghai who has had special experience in the use of artificial stone such as is used for all the face work of the new structure.

The new offices form a rectangular pile 220 feet long and 120 feet deep with four stories aggregating some 70 feet in height, faced in artificial grey granite.

Mr. Burnett has adopted the Neo-classic style, and indicates Roman influence in the treatment of the main floor windows but, in the final plans, this has been eliminated by the adoption of square, mullioned openings, leaving the style throughout purly Grecian.

The main facades consist of colonnades Ionic columns on pedestals rising clear above the terrace, surmounted by an attic order. Boldly displayed on the main frieze is the administration's title and the year of construction in Roman numerals fashioned in bronze. The main entrance occupies the three central bays of the Meadows Road frontage and is approached by a broad easy flight of the steps in natural granite which lead to the vestibule through treble swing doors.

The Basement

The basement stands practically at the level of the adjacent public roadways and is waterproofed to a degree calculated to withstand any possible water pressure. It will provide accommodation for the British post-office, the entry for which is on the west front ; for a chemical laboratory ; the heating and hot water installations ; record rooms as well as foreign and native kitchens.

Main Floor

The most striking feature of the main floor is the large galleried court occupying the centre of the building, and giving access to the principal offices, the grand marble staircase, elevators, the public counters, etc. The lighting of this court is obtained through a semi-circular dome fitted with leaded lights in which pale amber color predominates, relieved here and there with patches of sky blue and red. At night, electric lamps will diffuse light above the stained glass while the floor of the court will be amply illuminated from bracket lamps forming the lighting scheme of the corridors and from clusters of opaque circular globes supported by four bronze standards.

Main Hall of the New Kailan Building

Rising from a Mosaic tiled floor, and supporting the central dome, are sixteen columns of polished Tsingtao granite in a rich shade of red. These columns are 28 feet in height and of a mean diameter of three feet. Additional color is lent to the interior decoration by paintings typical of the administration's activities, which will fill the panels of the vertical walls of the dome.

Massive panelling in stone finished plaster constitute the general treatment of the interior walls conforming, in a modified degree, to the classic style of the exterior.

The managerial suite of rooms, connected by the private corridor, occupy the whole of the eastern front and are fitted throughout with hardwood parquetry flooring and massive oak panelling. Lamps concealed in the cornices will diffuse light to these apartments.

The board room, a spacious apartment of dimensions 50 by 30 feet, is

partially panelled in fumed oak and the walls are formed into a series of recesses by detached oak columns supporting the coffered ceiling.

Other portions of the main floor are taken up by the extensive coal selling and shipping business, and the various administrative offices requiring proximity to the direction, while the public counters, on pedestals of grey marble, extend into and occupy the western end of the central court.

The height of all enclosed apartments on this floor is eighteen feet.

The second floor provides ample accommodation for the Chinese and the accounting departments the rooms of the principal Chinese officials of the administration being finished in parquetry flooring, oak panelling and with concealed lighting effects.

The third floor affords accommodation for other subsidiary departments and leaves a substantial reserve for extensions in the future.

All the floors and the very extensive flat roof are connected by two electrically-driven six-passenger elevators. The hot water heating is from a two-unit installation deriving its power from small boilers of the Lancashire type: the treatment of sewerage by the modern septic process; the expulsion of all waste water and sewerage by pressure through a metal pipe communicating with the river and the use of the most modern appliances for ventilation, signalling and electric lighting.

The total estimated cost of the construction of the head offices is approximately half a million dollars, exclusive of the value of the land.

International Finance and Exchange, Inc.

A FORMAL announcement of international interest appeared recently in the *Manshu Nichinichi Shimbun* concerning the establishment of the International Finance and Exchange, Inc.

According to the articles of association, as registered with the American Shanghai court, exchanges necessary for dealing in merchandise, share stocks and currencies, in China and the other parts of the Far East may be founded. Transportation by railways, the construction of roads, canals, waterworks, telegraphs and telephones in China, Manchuria and Mongolia may be undertaken. Mining, fishery, agricultural, forestry and manufacturing industries, too, in the same regions are to be taken up. In addition, the installation of blast furnaces, electricity and other motor power, lighting services, wet docks, wharves and elevators of all kinds, and the erection of hotels and warehouses, with their management, and trading, etc., are to be undertaken as financiers. Banking business, issue of debentures, guarantee of payment, guaranty and trust business, exploiting of special privileges, etc., are also included in the new Company's sphere of operation.

OFFICIALS: On the management are mentioned the following names:—

Mr. Edwin W. Mills (American), organizer; Mr. S. Hayakawa (president, S.M.R. Co.), controller; Mr. T. Murano (president, *Manshu Nichinichi Shimbun*), chairman, committee for opening business; Messrs. Ohi, Namba, Sugino and Soyejima (standing committee); Messrs. Minami, Koike, Kanda, G. Mochizuki, Tokuda, Iwai, Mayeda, Kataoka, Takase and over twenty others (on the committee).

CHINESE REPRESENTATIVES: Mr. Yang-tu (high adviser to the president of China); Mr. Chou Tzu-chi (ex-minister of finance); Mr. Chang Kuo-chuan (president, administrative litigation court): Gen. Yen Chi-han; Gen. Hsu Shao-chen (chief of general staff of the Canton government); Gen. Lu Kung-wang (ex-military commander of Chekiang; Mr. Wu Tiao-ching (financier of Tientsin); Mr. Tsung Wei-chen (ex-senator); Mr. Cheng Chao-chi (capitalist residing abroad). In addition, some dozen names of note are on the list. It is understood that on the complete establishment of the new Company, a board of directors is to be nominated on the recommendation of Mr. S. Hayakawa (president, South Manchuria Railway Company), who is also the supreme adviser.

AIMS OF NEW CORPORATION: China, in the post-war times, has turned the central market for the world's economic exploitation, where businessmen of all nations are in competition. It would be against the interests of these countries to be carried away by petty jealousies into discord, for such will only convert China into a theatre of commercial warfare. This will impede the future development of China. If the inexhaustible resources dormant in China should be tapped by international co-operation on common capital, the results to be reaped will be immense, to be shared by all countries. Our present effort is to realize this ideal for investment in all kinds of enterprises on a joint management system, and to develop the natural resources of China, to the end of drawing closer the international relations of China, at the same time setting an example of promoting an undertaking of mutual good to the powers.

CAPITAL AND SHARES: The Company's capital was Y.1,000,000, at the start; it has been raised to Y.20,000,000, divided into 1,000,000 shares of Y.20 each. The first quarterly payment of Y.5 per share is to be completed during February, 1922.

PROSPECTUS: To begin with, the new Company is to set up at Tientsin an exchange transacting in gold and silver currencies, merchandise stocks, share stocks, etc. It will besides engage in financing and trust business, accepting stocks as security. The cultivation of cotton, etc., will be also invested in.

The sphere of operation is to be gradually extended to Shanghai, Hankow, Canton and other places that may be deemed desirable.

As to the business returns, even from the exchange and trust business at Tientsin alone, a dividend of more than 20 per cent. to the capital paid up is expected to be distributed.

SPECIAL CHARACTERISTICS OF NEW COMPANY: (1) CURRENCY BUSINESS: To China, a silver standard country, some auxiliary institution is necessary in doing business with gold standard countries, for the purpose of providing beforehand against possible fluctuations of exchange rate. At present, most of business carried on on the currency exchanges of China consists of spot or short-termed business, and there is no adequate medium to cover forward contract deals. The new Company is to fill this need, and offers the facility of concluding long-termed contract deals in terms of the liberal American law.

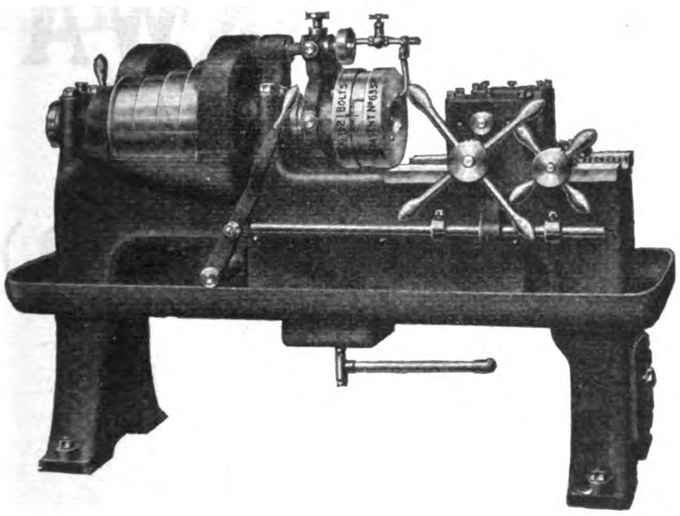
(2) FLOTATION OF DEBENTURES: In terms of the articles of association, the Company is authorized to issue debentures, and, as occasion demands, low interest capital may be absorbed for investment in ventures of any magnitude.

(3) SPECIAL BUSINESS PRIVILEGES: For the establishment of exchanges at various places in China, the Company has such a concession established in a general way. Therefore, even in case of opening business in any new quarter, no company need be founded separately for the purpose, but a branch or an agency of this Company may be entrusted to set about the work.

The American law imposes but a nominal tax on the business put through, so this is a decided advantage scored over the rival corporations.

HEAD OFFICE: The head office is located at Peking, China. Offices are expected to be opened in French Concession, Tientsin, in the Canton Road, Shanghai, and in the British Concession, Hankow. An office has been opened on Himono-cho, Nihonbashiku, Tokyo.

Heap's Patent Screwing Machines



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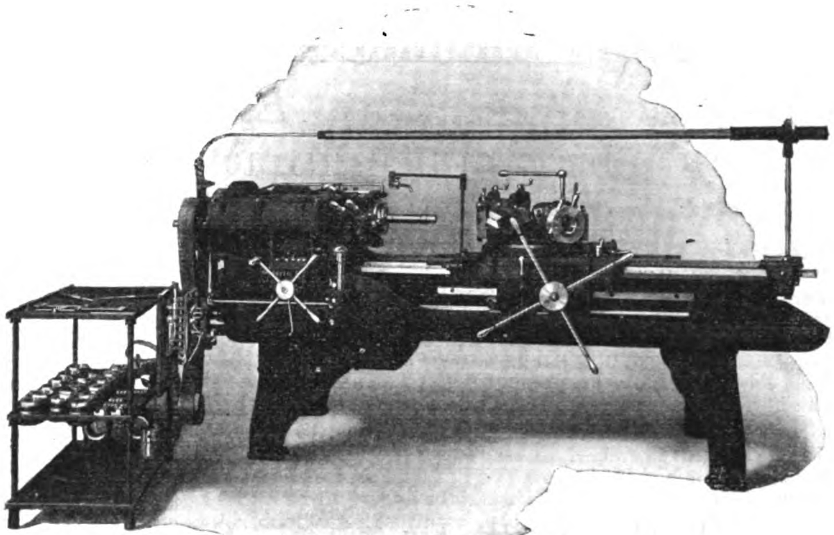

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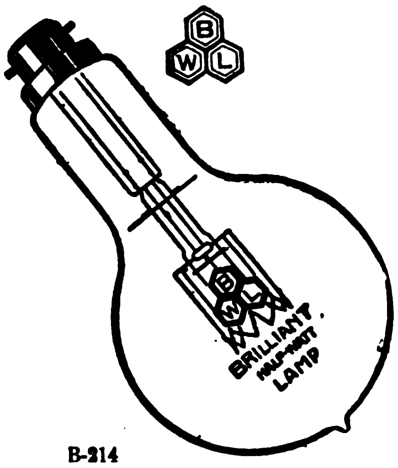

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Diamond·Fibre

SHEETS RODS TUBES

A superior grade of genuine hard or vulcanized fibre manufactured in America. Used extensively in the electrical, mechanical, trunk and baggage industries. By special process we eliminate dust, grit, metal and other substances, making DIAMOND-FIBRE especially pure and strong. Thus it can be sawed, cut, punched, drilled, threaded, tapped, bent, turned or stamped, with but little wear on tools. Because of its high dielectric strength it is used by the largest manufacturers of electrical equipment.

DIAMOND-FIBRE is made in Sheets, Rods and Tubes, of different qualities for different purposes. These are furnished in numerous sizes and gauges. If preferred, we will do the machining according to your specifications. Condensite Celoron for waterproof insulation and noiseless gears is a higher development of DIAMOND-FIBRE.

Some Uses of DIAMOND-FIBRE

Insulation	Parts for Starting, Lighting, and Ignition Systems, etc.	Chair Seats
Bushings and Cleats	Baggage	Combs
Switch Handles	Mill Baskets and Boxes	Roving Cans
Conduits	Receptacles	Spool Heads
Speedometer Gears		Robbin Heads and Boxes

Large stocks permit us to make prompt deliveries. Send for Booklet "DIAMOND-FIBRE and its Uses."

Diamond State Fibre Company

BRIDGEPORT, PA. (Near Philadelphia), U.S.A.

Representative with stock in Tokyo, Kobe and Shanghai

THE AMERICAN TRADING CO.

THE BANK OF CHOSEN

Capital Subscribed - - - Yen 80,000,000
Capital Paid-up - - - Yen 50,000,000

Governor : S. Minobe, Esq.
Deputy-Governor : T. Kano, Esq.

Directors :

S. Ohta, Esq. S. Katayama, Esq.
S. Yoshida, Esq. S. Kakei, Esq.

Head Office: SEOUL (Chosen)

FOREIGN DEPARTMENT : TOKYO

(All communications relating to correspondence arrangements and the Bank's general foreign business to be addressed to the Foreign Department)

Branches:

Japan Proper—Tokyo, Osaka, Kobe, Shimonoseki
Korea—Chemulpo, Pyengyang, Fusan, Wonsan, Taiku, Chinnampo, Kunsan, Mokpo, Hoilyong, Chongjin
Manchuria—Antung, Fengtien (Mukden), Dairen, Yingkow (Newchwang), Changchun, Harbin, Tiehling, Liaoyang, Ryojun, Kaiyuan, Chengchiatun, Szupingchieh, Fuchiatien, Kirin, Lungchingtsun
China Proper—Shanghai, Tientsin, Tsingtao, Tsinan
Siberia—Vladivostock, Alexandrofsky Post

NEW YORK AGENCY :

The City Investing Building, 165 Broadway, New York City

LONDON REPRESENTATIVE :

Gresham House, 24 Old Broad Street, London, E. C. 2

Correspondents:

San Francisco, Seattle, New York, London, Paris and in other commercial centers throughout the world

International Banking Corporation

CAPITAL, SURPLUS AND UNDIVIDED PROFITS: G. $14,000,000

OWNED BY THE NATIONAL CITY BANK OF NEW YORK

HEAD OFFICE: 60 WALL STREET, NEW YORK
LONDON OFFICE: 36 BISHOPSGATE, E.C.
LYONS OFFICE: 27 PLACE TOLOZAN
SAN FRANCISCO OFFICE: 232 MONTGOMERY STREET

BRANCHES:

CHINA
SHANGHAI
PEKING
TIENTSIN
HANKOW
HARBIN
HONGKONG
CANTON

DOMINICAN REPUBLIC
SANTO DOMINGO
SANCHEZ
SAN FRANCISCO DE MACORIS
SAN PEDRO DE MACORIS
SANTIAGO
PUERTO PLATA
BARAHONA
LA VEGA

INDIA
BOMBAY
CALCUTTA
RANGOON

JAPAN
YOKOHAMA
KOBE

JAVA
BATAVIA
SOURABAYA

PANAMA
PANAMA
COLON

PHILIPPINES
MANILA
CEBU

SPAIN
BARCELONA
MADRID

STRAITS SETTLEMENTS
SINGAPORE

BRANCHES OF THE NATIONAL CITY BANK OF NEW YORK

ARGENTINA
BUENOS AIRES
ROSARIO

BELGIUM
ANTWERP
BRUSSELS

BRAZIL
PERNAMBUCO
RIO DE JANEIRO
SANTOS
SAO PAULO

CHILE
SANTIAGO
VALPARAISO

CUBA
HAVANA AND 22 BRANCHES

ENGLAND
LONDON

ITALY
GENOA

PERU
LIMA

PORTO RICO
PONCE
SAN JUAN

RUSSIA
MOSCOW } Temporarily Closed
PETROGRAD }

URUGUAY
MONTEVIDEO

VENEZUELA
CARACAS

Commercial and Travellers' Letters of Credit, Bills of Exchange and Cable Transfers bought and sold. Current accounts opened and Fixed Deposits in local and foreign currencies taken at rates that may be ascertained on application to the Bank.

N. S. MARSHALL, *Manager.*

1A KIUKIANG ROAD.

BANQUE DE L'INDO-CHINE.

Capital	**Frs. 72,000,000**
Reserves	**„ 70,000,000**

HEAD OFFICE: 15 BIS RUE LAFFITTE, PARIS.

Succursales et Agencies:

Bangkok	Haiphong	Mongtze	Pnom-Penh	Singapore
Battambang	Hankéou	Nouméa	Pondichery	Tientsin
Canton	Hanoi	Papeete	Saigon	Tourane
Djibouti	Hongkong	Peking	Shanghai	

Bankers:

IN FRANCE: Comptoir National d'Escompte de Paris, Credit Lyonnais; Banque de Paris et des Pays-Bas; Crédit Industriel et Commercial Société Générale.

IN LONDON: The National Provincial and Union Bank of England, Ltd.; Comptoir National d'Escompte de Paris; Crédit Lyonnais.

The Shanghai Agency undertakes all banking operations and exchange business; grants credits on goods and approved securities and receives deposits on current and fixed deposits according to arrangement.

L. ARDAIN, *Manager.*

The First National Bank of Boston

The leading financial institution of New England

Foreign and domestic commercial banking of every nature.

Correspondence solicited.

THE ROYAL BANK OF CANADA

HEAD OFFICE, MONTREAL.

LONDON, ENG. PRINCES ST., E.C.

NEW YORK. 68, WILLIAM ST.

PARIS, FRANCE. THE ROYAL BANK OF CANADA (FRANCE)

BARCELONA. PLAZA DE CATALUNA 6

721 BRANCHES.

614 Branches in Canada and Newfoundland, also

107 FOREIGN BRANCHES.

ARGENTINE Buenos Aires (2 Branches).

BRAZIL Rio de Janeiro, Santos, Sao Paulo.

URUGUAY Montevideo.

VENEZUELA Caracas, Ciudad Bolivar. Maracaibo.

COLOMBIA Barranquilla.

COSTA RICA San José.

WEST INDIES

CUBA—Havana (9 Branches), Antilla, Banes, Bayamo, Caibarien, Camaguey, Camajuani, Cardenas, Ciego de Avila, Cienfuegos, Cruces, Cueto, Florida, Guantanamo, Jatibonico, Manzanillo, Matanzas, Moron, Nuevitas, Palma Soriano, Pinar del Rio, Puerto Padre, Sagua la Grande, Sancti Spiritus, Santa Clara, Santiago de Cuba, and at twenty other points.

PORTO RICO—San Juan, Mayaguez & Ponce. **HAITI**—Port-au-Prince, &c.

DOMINICAN REPUBLIC—S. Domingo, La Romana, Puerto Plata, Sanchez, S. Pedro de Macoris and Santiago de los Caballeros.

MARTINIQUE—Fort de France.

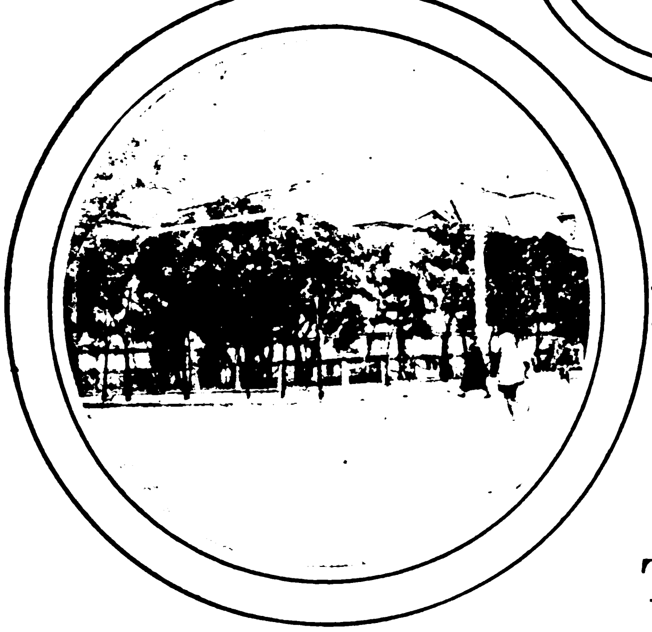
GUADELOUPE—Pointe-à-Pitre and Basse Terre.

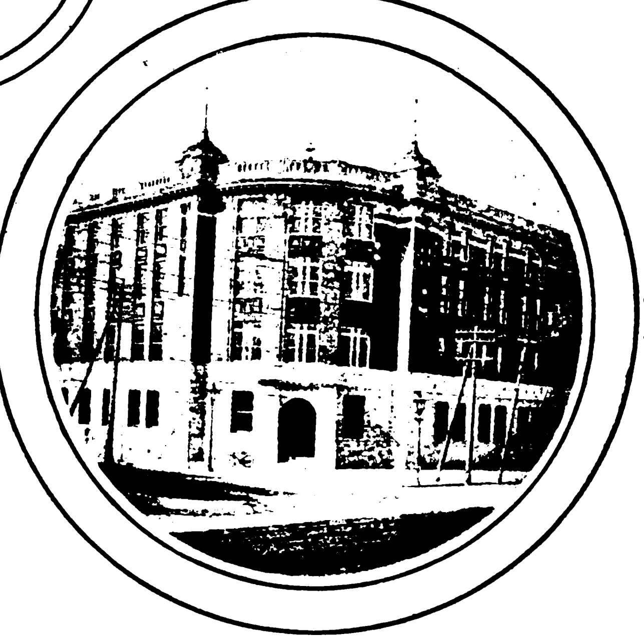
BRITISH WEST INDIES— Antigua, Bahamas, Barbados, Dominica, Grenada, Jamaica, Montserrat, Nevis, St. Kitts, St. Lucia, Trinidad and Tobago.

BRITISH GUIANA—Georgetown, New Amsterdam, &c.

BRITISH HONDURAS—Belize.

CAPITAL PAID UP & RESERVES $41,000,000 GOLD
TOTAL RESOURCES - $500,000,000 GOLD





THE BANK OF TAIWAN LTD.

INCORPORATED BY SPECIAL IMPERIAL CHARTER, 1899

Capital Subscribed - - - - - - -	Yen 60,000,000
Capital Paid-up - - - - - - - -	„ 45,000,000
Reserve Funds - - - - - - - -	„ 9,680,000

President: KOJURO NAKAGAWA, Esq. Vice-President: SHUNROKURO MORI, Esq.

DIRECTORS:

TSUNEKICHI IKEDA, Esq.
GUNJI KAWASAKI, Esq.
TADASU HISAMUNE, Esq.
KUMEMATSU MORINAGA, Esq.
MASUMI ESAKI, Esq.

***Head Office:* TAIPEH, FORMOSA (TAIWAN)**

BRANCHES:

JAPAN: Tokio (General Affairs Department), Kobe, Moji, Osaka, Yokohama.
TAIWAN: Keelung, Tainan, Takow, and 11 other points.
CHINA: Amoy, Canton, Foochow, Hankow, Kiukiang, Shanghai, Swatow.
OTHERS: Bangkok, Batavia, Bombay, Hongkong, London, New York, Semarang, Singapore, Soerabaya.

AGENTS AND CORRESPONDENTS:

In the Principal Cities and Towns throughout the World.

LONDON BANKERS:

BARCLAYS BANK, LTD. LLOYD'S BANK, LTD. LONDON COUNTY WESTMINSTER & PARR'S BANK, LTD.

TOKYO BRANCH:

No. 1, Eiraku-cho Ni-chome, Kojimachi-ku.

Telegraphic Address: "TAIWANGINK."

Phone Nos. 1060, 1061, 1062, 1063, 1064, 1065, 1066, 446, 447, 448 and 449, Marunouchi.

Interest allowed on Fixed Deposits, and Current Accounts on terms which may be ascertained on application. Most favourable terms are granted for Petty Current Accounts.

Every description of Exchange and General Banking business transacted.

Special facilities are available for exchange business on China, Straits Settlements, East Indies, Australia, Great Britain, Russia, America, Canada, South Africa, etc.

Industrial Bank of Japan, Limited

(NIPPON KOGYO GINKO)

Incorporated by Special Charter in 1902 to Encourage Foreign Investments

CAPITAL SUBSCRIBED - - - - -	Yen 50,000,000
CAPITAL PAID-UP - - - - - - -	Yen 45,000,000

HEAD OFFICE:
MARUNOUCHI, TOKYO. CABLES "KOGIN," TOKYO

BRANCHES:
TOKYO: NIHONBASHI
OSAKA: KORAIBASHI
KOBE: NAKAMACHI

H. HIJIKATA, Esq., President
Y. ONO, Esq., Vice-President
K. IYANAGA, Esq., Director
T. IWASA, Esq., Director
KOZO MATSUMOTO, Esq.

AUDITORS:
NAGATANE SOMA, Esq.
KINTARO HATTORI, Esq.
KINICHI KAWAKAMI, Esq.
TAICHI OHBA, Esq.

All descriptions of general banking, exchange, both foreign and domestic, and trust and corporation financial business transacted.

Correspondents in the principal cities at home, and in London, Paris, New York, and San Francisco.

BUSINESS TRANSACTED:

1.—Loans on the security of public bonds of debentures and shares, estates (Zaidan), specified land and buildings.
2.—Subscription and underwriting public bonds or debentures.
3.—Deposits and safe custody of valuables.
4.—Trust company business.
5.—Discounting of bills.
6.—Foreign exchange business.
7.—Other banking business sanctioned by the Minister of State for Finance in accordance with Law of Ordinance.

BANK OF COMMUNICATIONS

(Specially authorised by Presidential Mandates of April 7th, 1914 and October 31st, 1915 making the Bank of Communications a National Bank).

Head Office: Peking

CAPITAL . . Kuping Tls. 10,000,000

President: TSAO JOU LIN

Vice-President: JEN FUNG PAO

Every description of Banking and Exchange business transacted.
Interest allowed on Current Accounts and Fixed Deposits according to arrangement.
Credits granted on approved Securities.
Special Facilities for Transfers to all parts of China.

Branches

CHIHLI PROVINCE.—Peking, Tientsin, Tungchow, Paotingfu, Haitien, Tangshan, Shuntefu, Shengfang.

SHANTUNG PROVINCE.—Tsinanfu, Tsininchow, Chefoo, Techow, Tsaochwang, Lungkow.

HONAN PROVINCE.—Kaifeng, Lohyang, Chengchow, Chiaotso, Chowchiakow, Taokow, Leiho, Hsinhsiang, Changtefu, Hsinyangchow.

SHANSI PROVINCE.—Shihchiachwang, Tatungfu, Fengcheng, Yangkao.

KIANGSU PROVINCE.—Shanghai, Soochow, Wusieh, Chinkiang, Yangchow, Tsing-kiangpu, Pukow, Penpu, Hsuchow.

CHEKIANG PROVINCE.—Hangchow, Ningpo.

HUPEH PROVINCE.—Hankow, Shasi, Ichang.

KIANGSI PROVINCE.—Kiukiang.

HUNAN PROVINCE.—Changsha, Changteh, Yochow, Hengchow, Hsiangtan

SZECHUAN PROVINCE.—Chungking.

ANHWEI PROVINCE.—Wuhu, Anking, Hsuancheng, Panpu

KWANGTUNG PROVINCE.—Canton.

THREE EASTERN PROVINCES.—Yinkow, Fengtien, Changchun, Kirin, Tiehling, Sunchiatai, Liaoyang, Harbin, Chinhsien.

SPECIAL DISTRICTS.—Jehol, Kueihuacheng, Lenghsien, Chihfeng, Hsinsi, Kalgan (Chahar).

ABROAD.—Hongkong, Singapore.

THE SUMITOMO GOSHI-KAISHA

OSAKA, JAPAN

OWNERS OF BESSHI COPPER MINE, COAL MINES, SILVER AND GOLD MINES, ETC.

MANUFACTURERS OF

Tubes, Plates, Sheets and Bars of Copper, Brass, Bronze and other Alloys, Solid and Drawn Steel Tubes, Nails, Etc.—Superphosphate and Composite, Manure, Sulphuric and Nitric Acid, etc.

GENERAL WAREHOUSE AND BANKING BUSINESS

WORKS AND DEPARTMENTS

Warehouses ... ... Osaka, Kobe & Tokyo
Mining Offices ... ... Besshi, Wakamatsu, Sapporo & Ohgayu
WORKS:
Copper Works ... ... Osaka & Amagasaki
Fertilizer Works ... ... Niihama
Sales Departments ... ... Osaka, Kobe, Tokyo, Kure, Yokosuka, Hakata, Shanghai, Hankow and Tientsin

THE SUMITOMO STEEL WORKS, LTD.

OSAKA, JAPAN

President: Baron K. SUMITOMO

MANUFACTURERS OF

Steel Ingots, Steel Forgings, Steel and Iron Castings of Every Description for Railways, Shipbuilding Yards, Mines, Hydraulic Electric and Other Engineering Works, etc., etc.

THE SUMITOMO ELECTRIC & CABLE WORKS, LIMITED

OSAKA, JAPAN

President: Baron K. SUMITOMO

MANUFACTURERS OF

Copper, Brass, Bronze and Nickel Wires and Strips, Trolley Wires, Insulated Wires and Cables of Every Description for Telephone, Telegraph, Lighting, Power Transmission, etc., etc.

THE SUMITOMO BANK, LIMITED

Head Office: OSAKA, JAPAN
Cable Address: "SUMITBANK"
President: Baron K. SUMITOMO
Established March, 1912
(Successors to The SUMITOMO BANK)

Capital Subscribed	Yen 70,000,000	Reserve Fund	Yen 20,200,000
Capital Paid-up	„ 40,000,000	Deposits	„ 38,100,000

(as on 20th July, 1921)

Head Office: Kitahama, Osaka
City Offices: Semba, Bingomachi, Nakanoshima, Dotonbori, Kawaguchi, Tenma, Nipponbashi.
Home Branches: Tokyo (Tokyo, Toriaburacho, Fukagawa, Shinbashi, Asakusa), Yokohama, Nagoya, Kyoto (Kyoto and Nishijin), Kobe (Kobe and Hyogo), Onomichi, Niihama, Kure, Hiroshima, Yanai, Shimonoseki, Moji, Wakamatsu, Kokura, Hakata and Kurume.

Foreign Branches: Shanghai, Hankow, Bombay, London, New York and San Francisco.
Agents: The Sumitomo Bank of Hawaii, Ltd., Honolulu, Lloyds Bank, Ltd., London, National City Bank of New York, New York.
Correspondents: In all important places at home and abroad.

The Bank buys, sells and receive for collection Drafts and Telegraphic Transfers, issues Commercial and Travellers Letters of Credit available in all important parts of the world, besides doing general Banking business.

THE

MITSUBISHI BANK,

LIMITED

CAPITAL SUBSCRIBED - Yen 50,000,000

CAPITAL PAID-UP - - - Yen 30,000,000

PRESIDENT:

Baron Koyata Iwasaki

MANAGING DIRECTORS:

Mr. Manzo Kushida — Mr. Mikitaro Kikuchi

Mr. Kiyoshi Sejimo — Mr. Takeo Kato

HEAD OFFICE:

No. 1 Yayesucho Itchome, Kojimachi-ku, Tokyo, Japan.

BRANCH OFFICES:

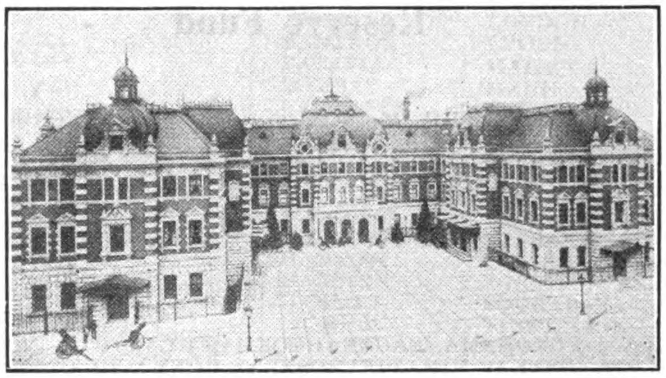
Fukagawa (Tokyo), Marunouchi (Tokyo), Nihombashi (Tokyo), Osaka, Nakanoshima (Osaka), Kobe, Kyoto, Nagoya, Shanghai, New York and London.

General Banking and Exchange Business

Agents for Hongkong and Shanghai Banking Corporation

THE MITSUI BANK, LTD.

The Oldest Bank in Japan, Founded in 1673



Capital Subscribed... ....Y. 100,000,000.00
Capital Paid-Up......................Y. 60,000,000.00
Reserve Fund (July 1921)......Y. 28,000,000.00

HEAD OFFICE:

No. 1 Suruga-cho, Nihonbashi-ku, TOKYO

BOARD OF DIRECTORS:

GENYEMON MITSUI, Esq. (*President*); SEIHIN IKEDA, Esq., UMEKICHI YONEYAMA, Esq., NAOJIRO KIKUMOTO, Esq. and OTOHIKO MAJIMA, Esq. (*Managing Directors.*)

TOMITARO HARA, Esq., KANETARO KISHIMOTO, Esq., HIROKICHI KAMESHIMA, Esq. and KIKUSABURO FUKUI, Esq. (*Directors*).

Branches:

NIHONBASHI (Tokyo), OTARU, YOKOHAMA, NAGOYA, KYOTO, OSAKA, NISHI (Osaka), KAWAGUCHI (Osaka), NAKANOSHIMA (Osaka), KOBE, HIROSHIMA, SHIMONOSEKI, MOJI, WAKAMATSU, FUKUOKA, NAGASAKI, SHANGHAI.

Foreign Agents:

London: Barclays Bank, Ltd.
London Joint City & Midland Bank, Ltd.

New York: The National City Bank of New York.
The Chase National Bank.
Bankers Trust Co.

Paris: Banque de l'Union Parisienne.
Comptoir National d'Escompte de Paris.

Bombay: National Bank of India, Ltd.

THE DAI-ICHI GINKO, LTD.

(FORMERLY THE FIRST NATIONAL BANK)

ESTABLISHED 1873

Subscribed Capital - - - - Yen 50,000,000.00
Paid-Up Capital - - - - Yen 36,350,000.00
Reserve Fund - - - - Yen 31,500,000.00

Y. SASAKI, *President*

K. ISHII, *Managing Director.* Y. NOGUCHI, *Managing Director.* S. SUGITA, *Managing Director.*

HEAD OFFICE:
No. 1 KABUTO-CHO, NIHONBASHI-KU, TOKYO.
T. AKASHI, *Manager*

CITY BRANCHES:
ISECHO, SHIN-OSAKACHO, FUKAGAWA, MARUNOUCHI.

HOME BRANCHES:
YOKOHAMA, NAGOYA, YOKKAICHI, KYOTO, NISHIJIN (KYOTO), GOJO (KYOTO), FUSHIMI, OSAKA, NISHIKU (OSAKA), MINAMIKU (OSAKA), HONMACHI (OSAKA), KOBE, HYOGO, HIROSHIMA, SHIMONOSEKI, CHOFU, MOJI, FUKUOKA, KURUME, KUMAMOTO, HAKODATE, OTARU, SAPPORO, MURORAN.

BRANCHES IN COREA:
SEOUL, FUSAN.

LONDON & NEW YORK BANKERS:

London:
- London County Westminster & Parr's Bank, Ltd.
- The London Joint City & Midland Bank, Ltd.
- The Yokohama Specie Bank, Ltd.

New York:
- The National City Bank of New York.
- The National Bank of Commerce in New York.
- The Yokohama Specie Bank, Ltd.

CORRESPONDENTS:
The Bank, in addition to its own Branches, has numerous Agencies or Correspondents in the principal Cities and Towns at Home and Abroad.

THE EAST ASIA INDUSTRIAL

COMPANY, LIMITED

(TOA KOGYO KABUSHIKI KAISHA)

TOKYO

ESTABLISHED 1909

FINANCIERS AND CONTRACTORS

K. ARAI, Esq., *President*

R. SHIRAIWA, Esq., *Managing Director*

Subscribed Capital . . . . . Yen 20,000,000
Paid-up Capital . . . . . . „ 11,500,000

Branches: SHANGHAI, PEKING, HANKOW.

Hongkong and Shanghai Banking Corporation

Paid-up Capital ...	$20,000,000
Reserve Funds: Sterling ...	£4,500,000
Silver ...	$21,500,000
Reserve Liability of Proprietors ...	$20,000,000

Court of Directors:

G. T. M. EDKINS, Esq.
Chairman

G. M. DODWELL, Esq.
Deputy Chairman

D. G. M. BERNARD, Esq.
A. S. GUBBAY, Esq.
P. H. HOLYOAK, Esq.
Hon. Mr. A. O. LANG
E. V. D. PARR, Esq.
W. L. PATTENDEN, Esq.
J. A. PLUMMER, Esq.
H. P. WHITE, Esq.

Head Office:
HONGKONG

Chief Manager:
HONGKONG . . . Hon. Mr. A. G. STEPHEN

London Bankers:
LONDON COUNTY WESTMINSTER AND PARR'S BANK LTD.

Shanghai Branch: 12 The Bund
Sub-Agency: 9 Broadway

Branches and Agencies:

AMOY	LONDON
BANGKOK	LYONS
BATAVIA	MALACCA
BOMBAY	MANILA
CALCUTTA	NAGASAKI
CANTON	NEW YORK
CHEFOO	PEKING
COLOMBO	PENANG
DAIREN	RANGOON
FOOCHOW	SAIGON
HAIPHONG	S. FRANCISCO
HANKOW	SHANGHAI
HARBIN	SINGAPORE
ILOILO	SOURABAYA
IPOH	TIENTSIN
JOHORE	TSINGTAO
KOBE	VLADIVOSTOCK
KUALA LUMPUR	YOKOHAMA

Interest allowed on Current Accounts and on Fixed Deposits according to arrangement.

Local Bills Discounted. Credits granted on approved Securities and every description of Banking and Exchange business transacted Drafts granted on London and the chief commercial places in Europe, India, Australia, Africa, China, Japan and America.

G. H. STITT, *Manager.*

THE JUGO GINKO, Ltd.

(THE FIFTEENTH BANK)

TOKYO, JAPAN

Telegrams: "Jugoginko, Tokio"

Capital Subscribed Y. 100,000,000 Capital Paid-Up Y. 49,750,000 Reserve Funds Y. 17,478,600

President:
HON. IWAO MATSUKATA

Vice-President:
MASAYASU NARUSE, Esq.

Managing-Directors:
YUTSUHA SATO, Esq. KANESATO AIKO, Esq.

Directors:
BARON KOKICHI SONODA
MARQUIS YORIMICHI TOKUGAWA
VISCOUNT YUKIYOSHI AOYAMA
HON. NAGAYUKI ASANO
YOSHITERU SHIMIZU, Esq.
MASAO MATSUKATA, Esq.
KIYOSUMI TANIKAWA, Esq.

Auditors:
MASAKAZU HISANO, Esq.
BARON MICHITOMO IWAKURA
NAOYOSHI YAMAMOTO, Esq.
TAKAJI SEKIGUCHI, Esq.
TAKAYUKI IMAI, Esq.

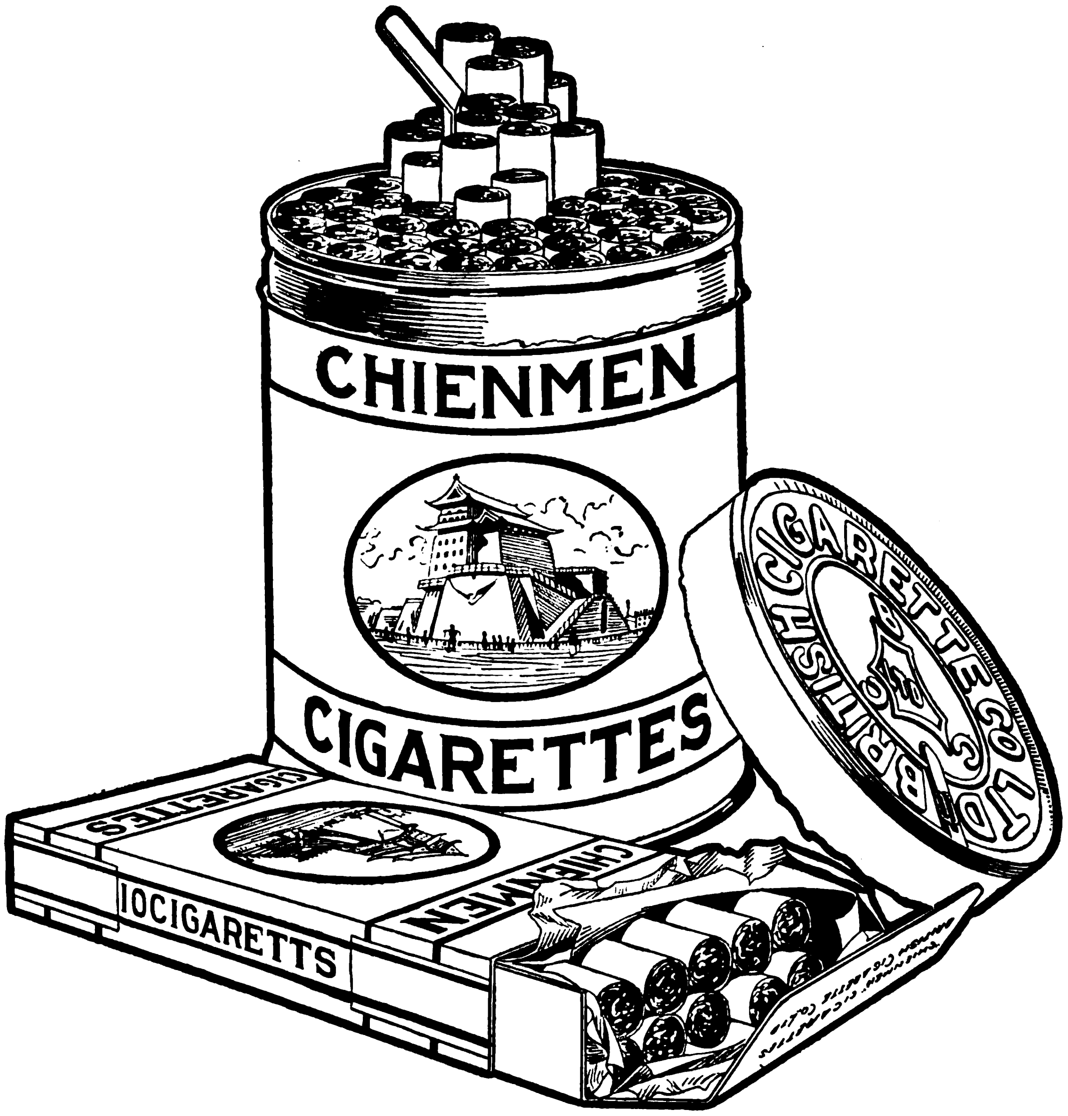
Head Office Manager: **Kiyosumu Tanikawa, Esq.**

LONDON BANKS AND AGENTS:

LAZARD BROTHERS & CO., LTD. UNION DISCOUNT CO. OF LONDON, LTD.
LONDON COUNTY WESTMINSTER AND PARR'S BANK, LTD.

CHIENMEN

Cigarettes



A brand well known to the "High Grade Cigarette Smoking Public" of China.

BRITISH-AMERICAN TOBACCO CO. (CHINA), LTD.

Distributors

Star Brand Galvanized Sheets

STAR
—BRAND—
UNITED STATES STEEL
PRODUCTS COMPANY
NEW YORK. U. S. A.

THERE is frequent inquiry and a steady demand for a Galvanized Sheet with an EXTRA HEAVY COATING. To meet this situation we have placed on the market a special product which we are offering under STAR brand, as illustrated above, each and every sheet being stamped with this brand. This special sheet is made of special steel containing an alloy of copper, which is known as our "Keystone Copper Steel." This superior rust-resisting base is galvanized with an *extra heavy coating* of pure virgin zinc or spelter of the very best grade, thus insuring the greatest durability and effectiveness.

While the price of this extra quality sheet is quite naturally and necessarily higher than the well-known APOLLO brand, the charge therefor is only sufficient to cover the additional cost of manufacture. For Roofing and Siding of PERMANENT structures this high grade sheet is recommended without hesitation, the extra life more than making up for the increased first cost.

Our STAR brand sheets are offered only in formed material, such as Corrugated Roofing, Siding, Etc.

United States Steel Products Company

THE BUND AND CANTON ROAD, SHANGHAI, CHINA

22 WU LIANG TA JEN HUTUNG, PEKING, CHINA

15 NAKADORI MARUNOUCHI, TOKYO, JAPAN

AMERICA-JAPAN-CHINA TRUST COMPANY, LIMITED

HEAD OFFICE:
6 Nakabashi Izumicho, Kyobashi-ku, Tokyo.

BRANCH OFFICE:
11 Imabashi Nichome, Higashiku, Osaka.

CAPITAL - - Y. 50,000,000.00

Directors:

Michitaka Sugawara, *Chairman*
Seiji Nawa, *Managing Director*
Toyotsune Mikami
Count Kinjiro Hirosawa
Wu Ting Chang
Kenji Imanishi, *Managing Director*
Taiji Arai
Seishichi Iwasaki
Saburosuke Fujisaki
F. N. Shea

Auditors:

Kanzo Matsuo, Standing
Toyohiko Kuki
Motosaburo Kaneko
Takayoshi Kondo

Councillors:

Raizo Kanda
Katsutaro Kamada

Principal Business of this Company as follows:

1. Financing of Domestic and Foreign Enterprises.
2. Underwriting Public Bonds, Debentures and other Securities.
3. Guaranteeing Loans, Debts and Credits.
4. Issuing Letters of Credit and Accepting Bills.
5. Assisting in the Organization of various enterprises and in the financial re-adjustment of Companies.
6. All other kinds of Trust Business.

ARCHIBALD LOW & SONS, LTD.

MERKLAND WORKS

PARTICK, GLASGOW, SCOTLAND

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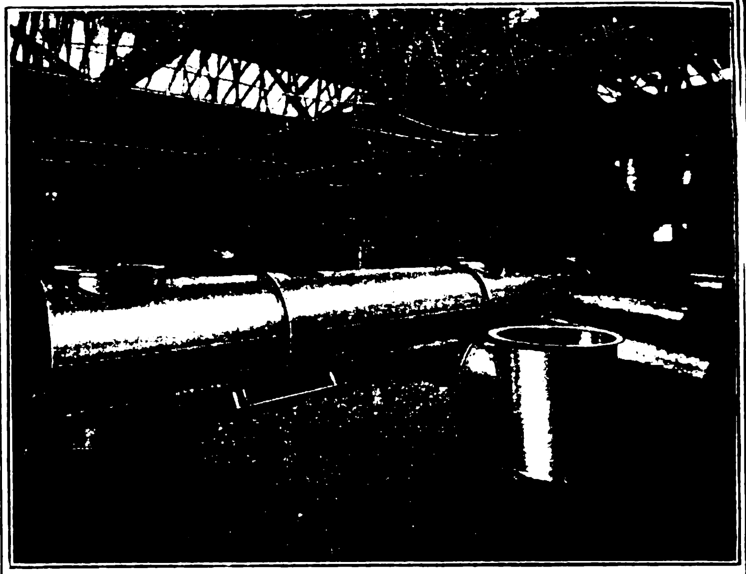

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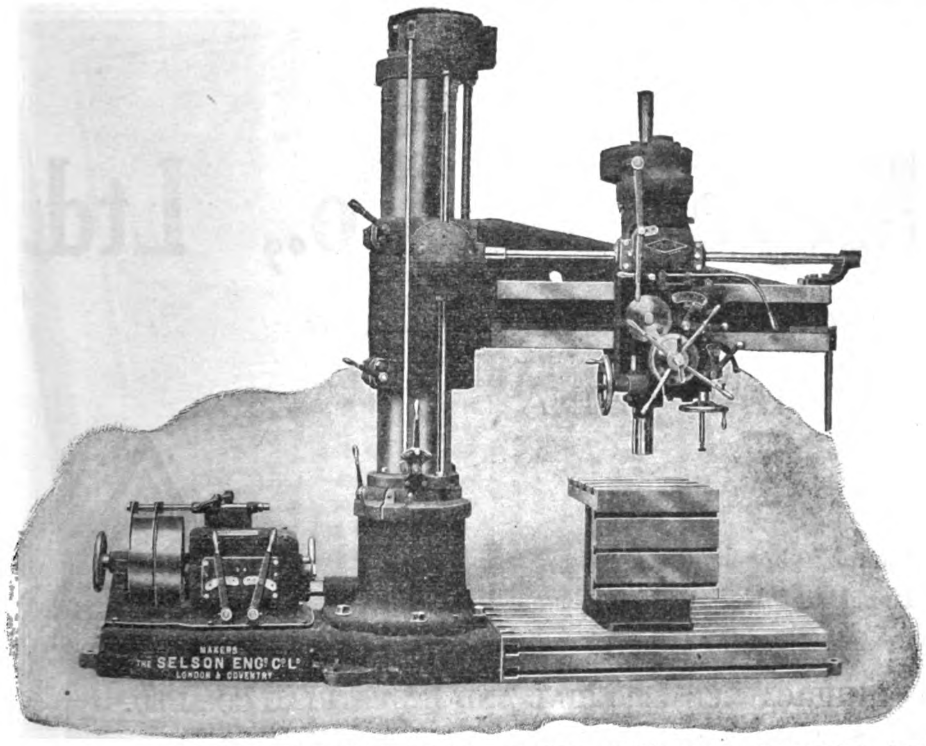

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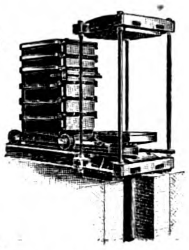

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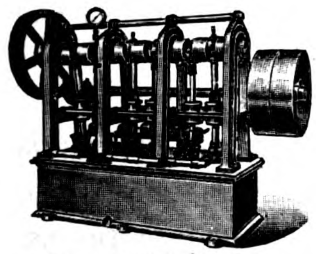

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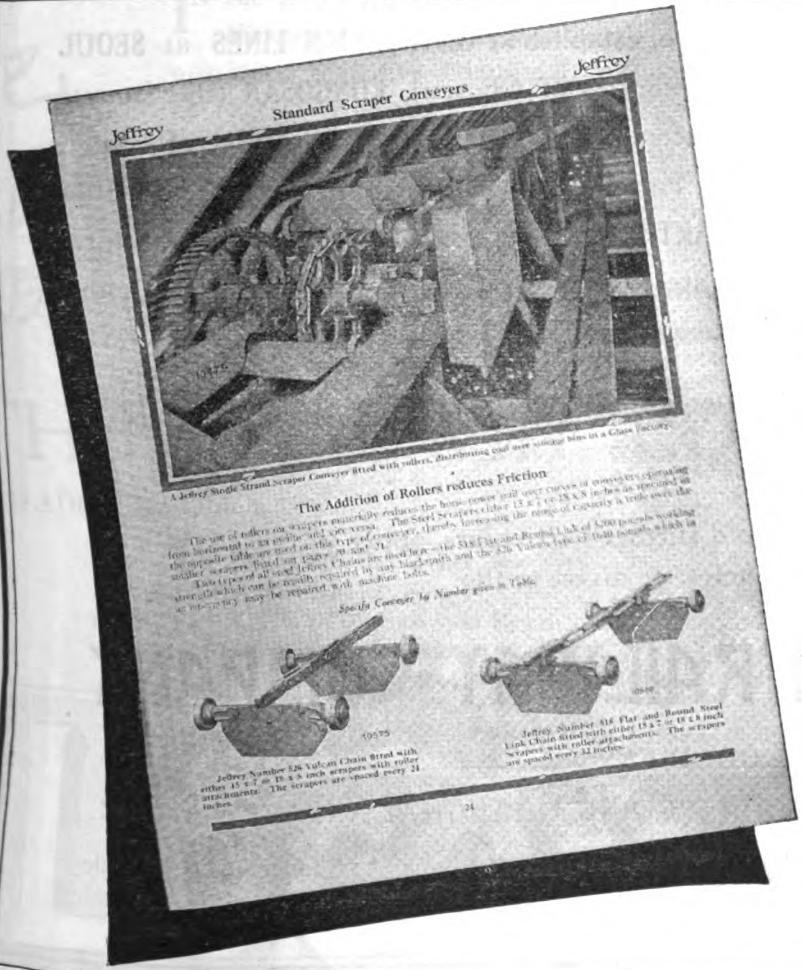

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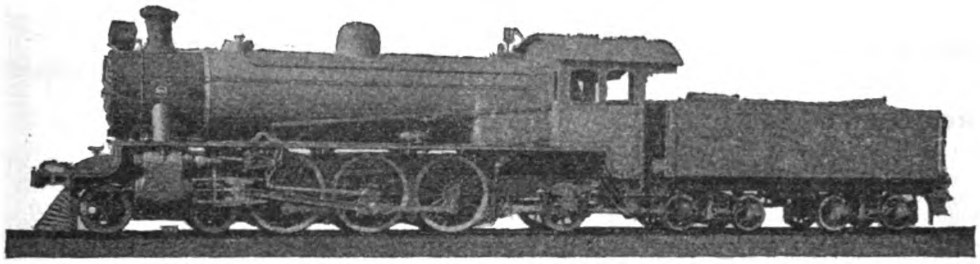

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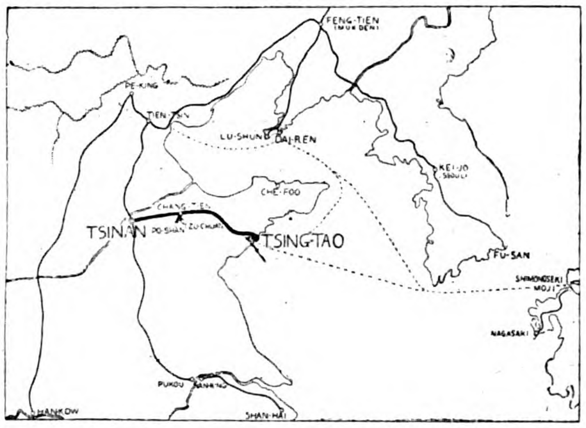

THROUGH TRAFFIC

Through passenger tickets are issued between the following principal stations of the Shantung Railway: Kiaochow, Kaomi, Fangtsu, Weihsien, Chingchow, Changtien, Choustun, Tsinan, Tzuchuan, Poshan, and the following points: In Manchuria—Port Arthur, Newchwang, Liaoyang, Fushun, Mukden, Tiehling, Kaiyuan, Changchun, Penchihu, Antung, and Dairen; in Japan—Tokyo, Yokohama, Nagoya, Kyoto, Osaka, Kobe, Ujina, Moji, Shimonoseki, Nagasaki and Shanghai.

Steamer Connections—Steamers leave the wharves of the Large Harbour, Tsingtao, for Moji and Kobe every five days, for Shanghai about twice a week and for Dairen about three times a week.

For giving facilities to through passengers for Japan, a special train in connection with the night train No. 4 is operated from the Harbour Station to the Wharf, direct alongside the ship, on those days when the liners of the Nippon Yusen Kaisha, Osaka Shosen Kaisha, and Harada S.S. Co. are leaving.

Through passengers and their luggage are carried free of charge for this section.

Collieries—The Tzuchuan (Shisen) and Fangtzu (Boshi) Collieries are managed by the Mining Department of the Shantung Railway. At present the daily output of Tzuchuan coal is about 1,500 tons, far surpassing the amount taken out when the Germans were in control. The coal is well-known for its good quality and fair price.

Tsinan—Tsinan, the capital of Shantung, is the western terminus of the Shantung Railway, and also one of the most important stations on the Tientsin-Pukow Railway.

The Tsinan Railway Hotel, furnished in modern European style, is found on the upper floor of the Tsinan Station, under the control of the Shantung Railway Administration.

THROUGH TRAIN SERVICE

Train No. 1 leaves Tsingtao daily 8.00 a.m. arrives Tsinan 6.30 p.m.
Train No. 3 leaves Tsingtao daily 9.30 p.m. arrives Tsinan 8.30 a.m.
Train No. 2 leaves Tsinan daily 8.00 a.m. arrives Tsingtao 6.30 p.m.
Train No. 4 leaves Tsinan daily 11.00 p.m. arrives Tsingtao 9.30 a.m.

Local Trains run between Tsingtao and Kaomi, Weihsien and between Fangtzu and Tsinan, and on the Poshan and Tzuchuan colliery branches.

Fares—Tsingtao-Tsinan—1st class, $14.30 ; 2nd class, $7.20.

First Class Sleeping Car—A first-class sleeping car is attached to night trains Nos. 3 and 4 running between Tsingtao and Tsinan. For a berth in the sleeping car in S.Y. 3.00 for the lower berth and S.Y. 2.00 for the upper berth is charged in addition to the ordinary first-class fare, irrespective of distance.

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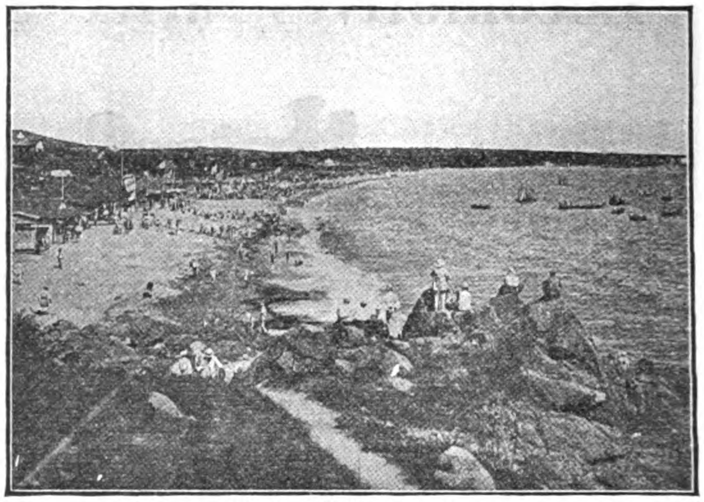
Ticket Agencies—Messrs. Thos. Cook & Son and their branch offices in various parts of the world. The Japan Tourist Bureau in Tokyo and their Agents in Yokohama, Kobe, Nagasaki and Peking.

Connections at Tsingtao—By steamer with Japan, Manchuria and Shanghai.

Connections at Tsinan—By Tientsin-Pukow Line with Tientsin, 6.00 & 9.38 a.m. daily, and with Pukow, 7.44 a.m. & 10.21 p.m. daily.



BATHING BEACH, TSINGTAO.

Description of Tsingtao

Tsingtao is considered the most healthful place in all the Far East. The scenery including both mountains and sea, is most beautiful. There are quite extensive forest gardens, bits of woodland here and there, and many delightful shady lanes affording most interesting walks through them,

The roads are all broad, with very moderate gradients. They are of both macadamized and asphalt construction for vehicle traffic, while the sidewalks are either paved or concrete. These streets are practically all lined with beautiful shade trees.

The buildings are constructed principally in modern European style, with red tiles and white walls, contrasting pleasantly with the surrounding green mountains and blue sea.

The climate here is fine from Spring to Autumn, being neither too hot nor too cold. These climatic conditions make the place a favourite summer resort for Europeans and Americans from Shanghai, Tientsin, and other places.

The hotels are luxuriously furnished with up-to-date equipment and are under the efficient management of Mr. H. J. Hearne.

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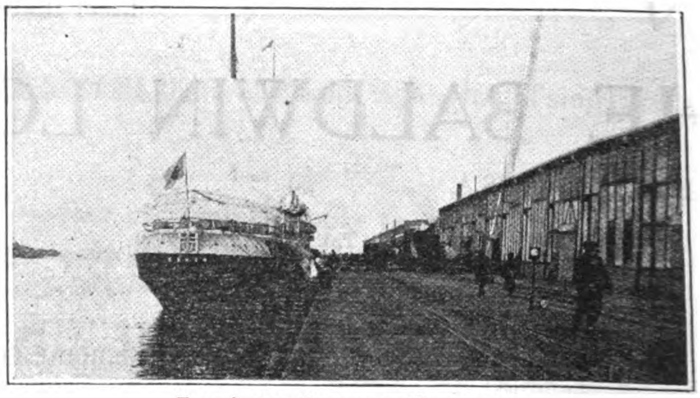

THE GREAT HARBOUR, TSINGTAO

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THE SHANTUNG RAILWAY ADMINISTRATION, TSINGTAO

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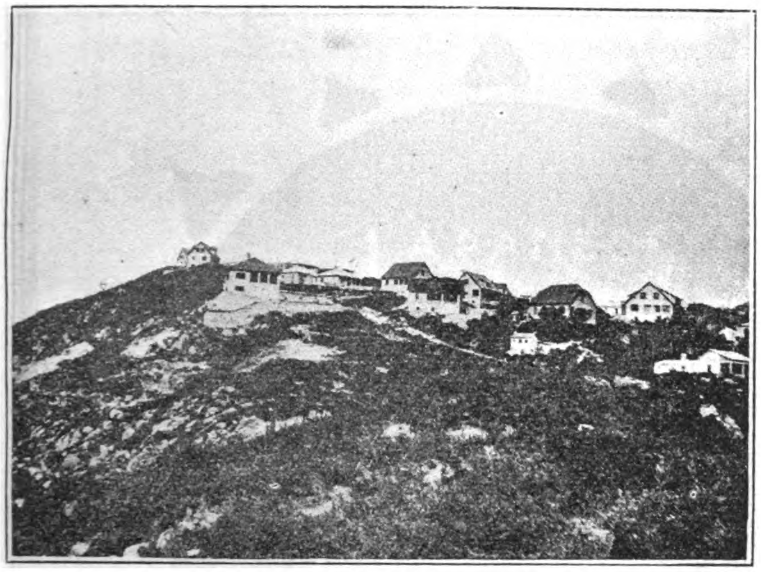
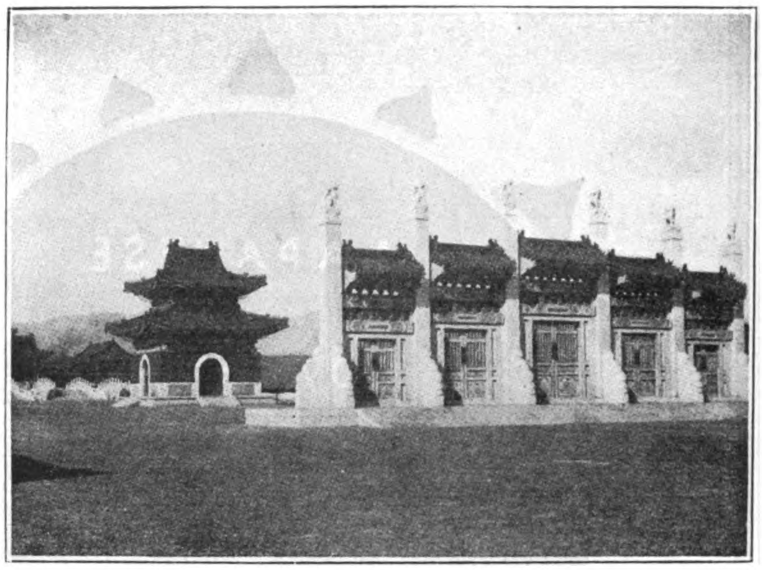


SUMMER RESORT AT CHI KUNG SHAN



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The Peking-Hankow route joins at Fengtai the main line of the Peking-Mukden Railway, by means of which this line is connected with the railways in Manchuria, Korea, Japan, and Siberia, while steamer facilities at Hankow bring it into easy communications with the Yangtze River ports and Shanghai.

From the Capital to Hankow the journey occupies 34 hours, by the daily through train which is provided with up-to-date sleeping and dining accommodations.

In the future, this line will connect by means of a ferry-boat the Hankow-Canton Railway whose completion will bring the Capital of China, and Hankow, the Great Central Market, within easy distance of Canton the southeastern metropolie.

From the Capital to Hankow the journey about 30 hours by the bi-weekly "Express" through train which is provided with up-to-date sleeping and dining accommodations.

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Hsi-ling or Western Imperial Tombs.—With their present-day accessibility, there is now little excuse for visitors to Peking omitting a trip to the Western Imperial Tombs, undoubtedly one of the most impressive sights in China. The site of these beautifully adorned Imperial Tombs is close to Liang Ko Chwang station, 79 miles from Peking, which is reached by a Branch-line, formerly built for the exclusive use of the Imperial Sovereigns when visiting the Tombs of their ancestors. The Western Tombs include the mausoleums of four Manchu Emperors and three Empresses, as well as those of a number of Princesses. The region, as a well laid-out park, closely wooded, is justly appreciated for the charming scenery surrounding the Imperial Tombs and is highly recommended to any one in search of the extraordinary and beautiful.

For Particulars, Pamphlets, Reservations, Tickets, etc., apply to the "Information Bureau" at Peking Head Office or to Tourist Agencies.

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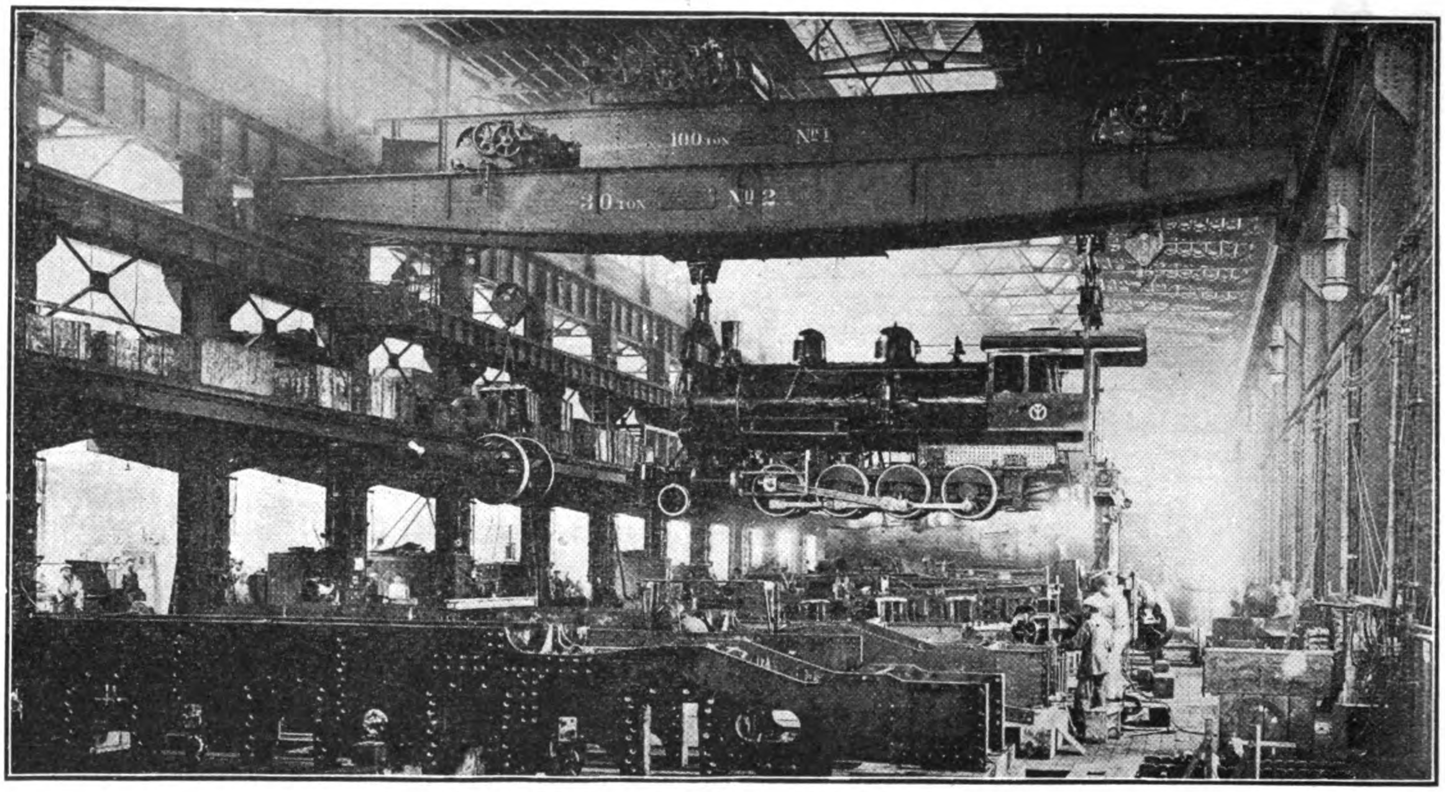

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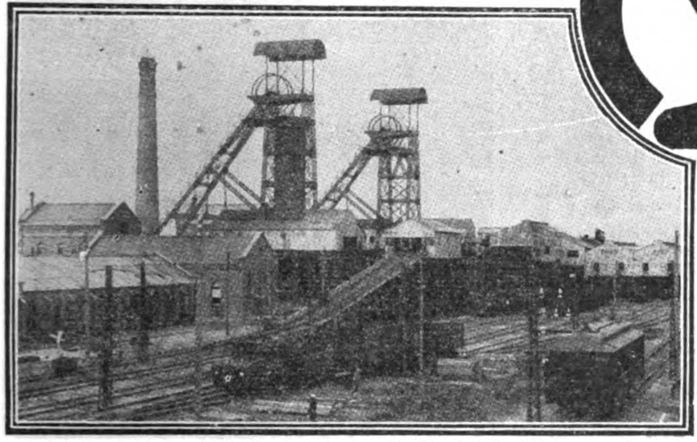
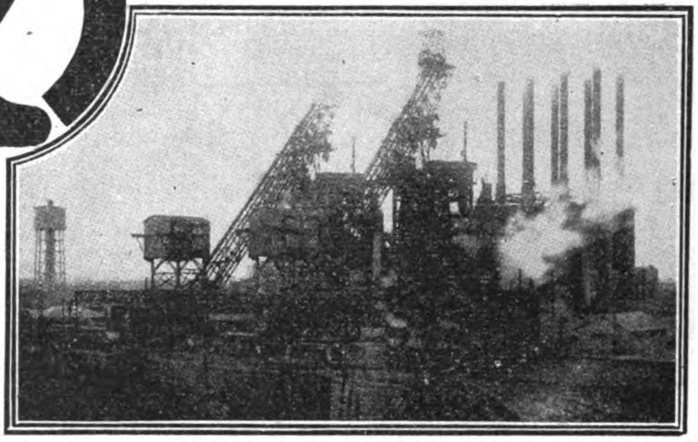


Togo Pit of the S.M.R. Fushun Collieries



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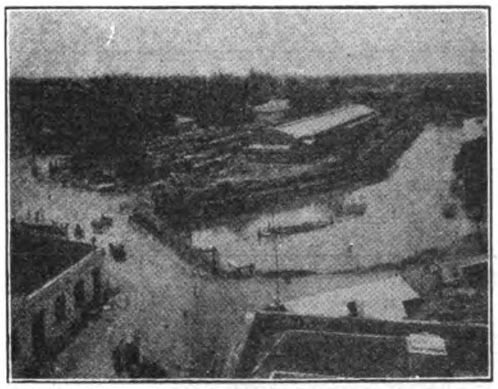
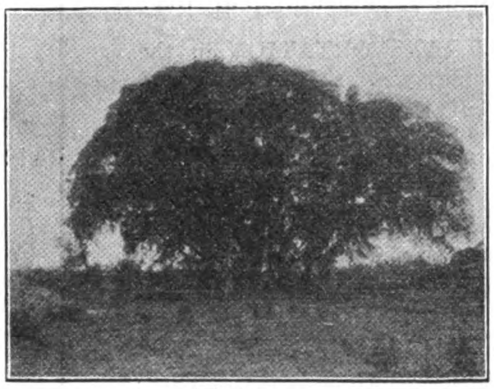


Bridge Bi Cis, Soerabaia Goods-shed, Java State Railways, Soerabaia City.

Girl Carrying Capoc.



Waringin.

Java, the peerless gem in that " magnificent Empire of Insulinde, which winds about the equator like a garland of emeralds," is the ideal tropical island, the greenest, the most beautiful and the most exquisitely cultivated spot in the East, the most picturesque and satisfactory bit of the tropics anywhere near the world's great routes of travel.

It fulfils the conception of what a paradise ought to be. It satisfies the imagination and more—for no Northern imagination ever conceived of skies so soft or indolent as these, of seas so serene and beautiful, of landscapes so exquisite or of nature so bountiful.

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And to close this incomplete list of Java's advantages, it is singularly accommodating as regards climate. Thanks to the mountainous character of its physical conformation, and the different altitudes of its towns and hill stations, the visitor can select the climate best suited for his constitution. In a few hours he may change from the tropics to the temperate zone, may migrate from Batavia to Sindanglaja, 3,483 feet above the sea-level, or from Soerabaia to Tosari, at an altitude of 5,776 feet, and famous for its bracing air.

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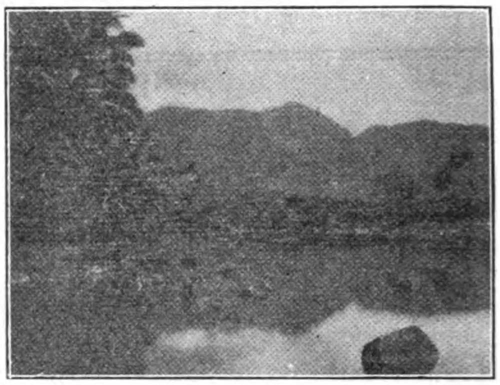
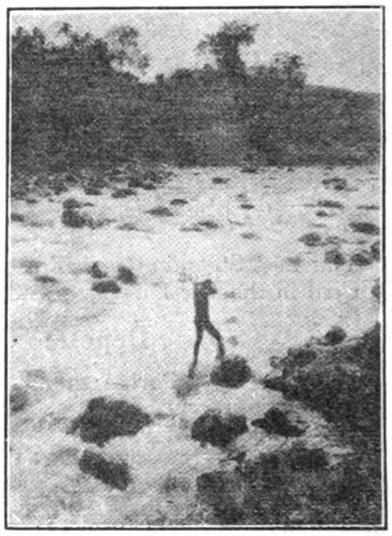


Pond in the Neighborhood of Garoet.

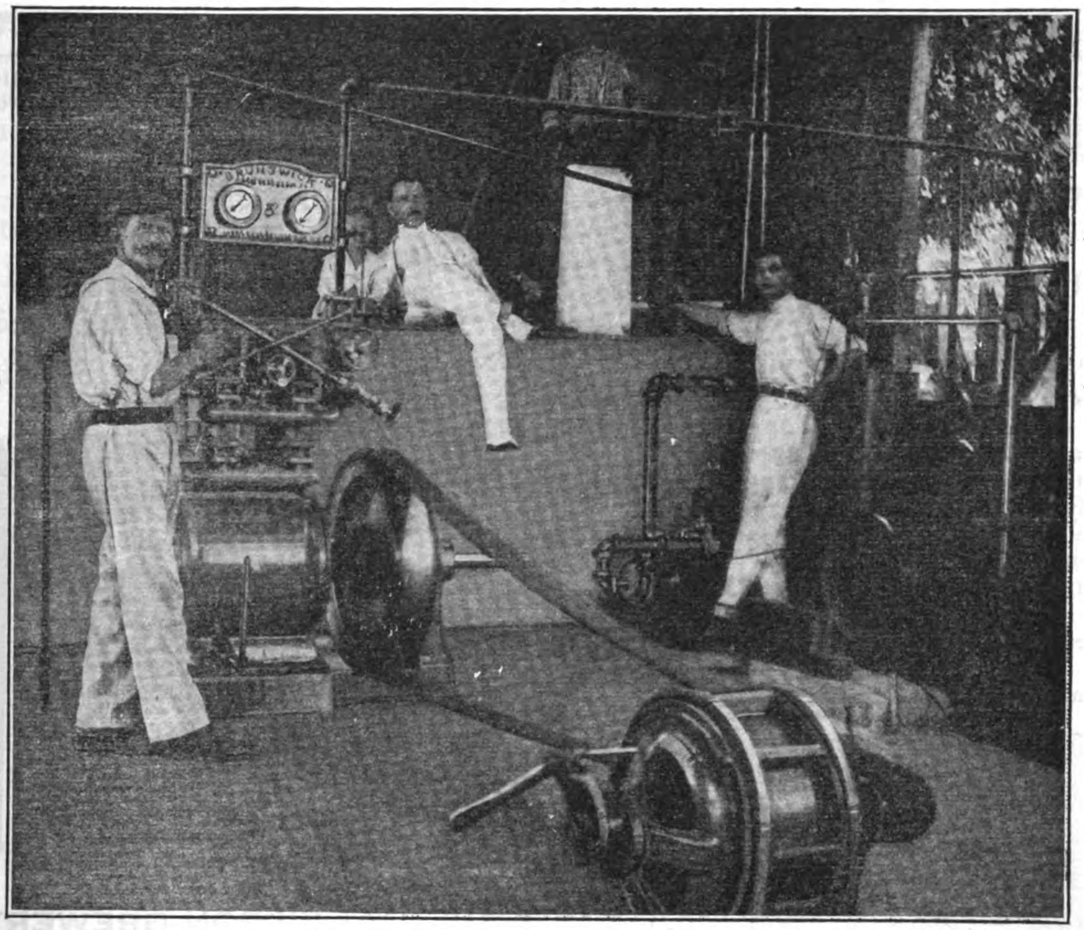


River Brantas, Malang.

Caves, Sou.h Coast, Java.

THE JAVA GOVERNMENT RAILWAYS

The photographs in this advertisement are from " The Joint-Stock Co., Photographer's Studio, Kurkdjian, Soerabaia."



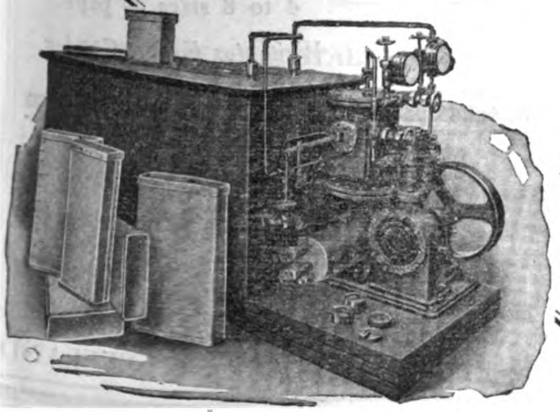
Brunswick Refrigeration

We show here a Brunswick installation in the ice-making plant of Juan B. del Giudice of San Pedro de Macoris, D. R. The cut illustrates clearly both the simplicity and efficiency of the Brunswick equipment, its rugged construction and its ease of operation. This machine was installed in 1914, has been in constant operation ever since and has given such satisfaction that a second similar machine has lately been installed. Attention is directed to the perfection of the cake of ice just drawn from the can.

Brunswick refrigerating and ice-making machinery is adaptable to numerous industries, markets, dairies, meat and produce preserving plants, bottling establishments, cold storage, etc. These machines can give refrigeration and produce ice at one and the same time and are, in every respect, absolutely dependable. Blue prints and detailed instructions for installation and operation furnished with each plant. If interested, we shall be glad to tell you more about these useful machines.

BRUNSWICK REFRIGERATING CO.

NEW BRUNSWICK, N.J., U.S.A.



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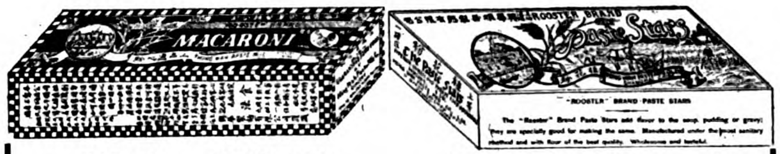
We particularly call attention to our standard portable ice-making plant, shown opposite. This little equipment produces 250 lbs. of ice daily. It is shipped complete and ready to make ice as soon as charged with ammonia and connected to power and water supply.

We also manufacture ice-making machines varying in capacities up to six tons daily.



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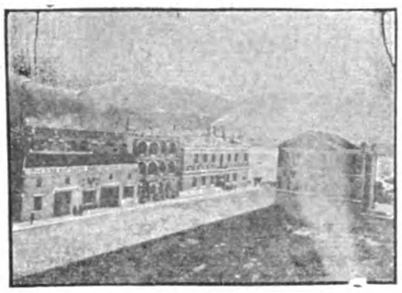

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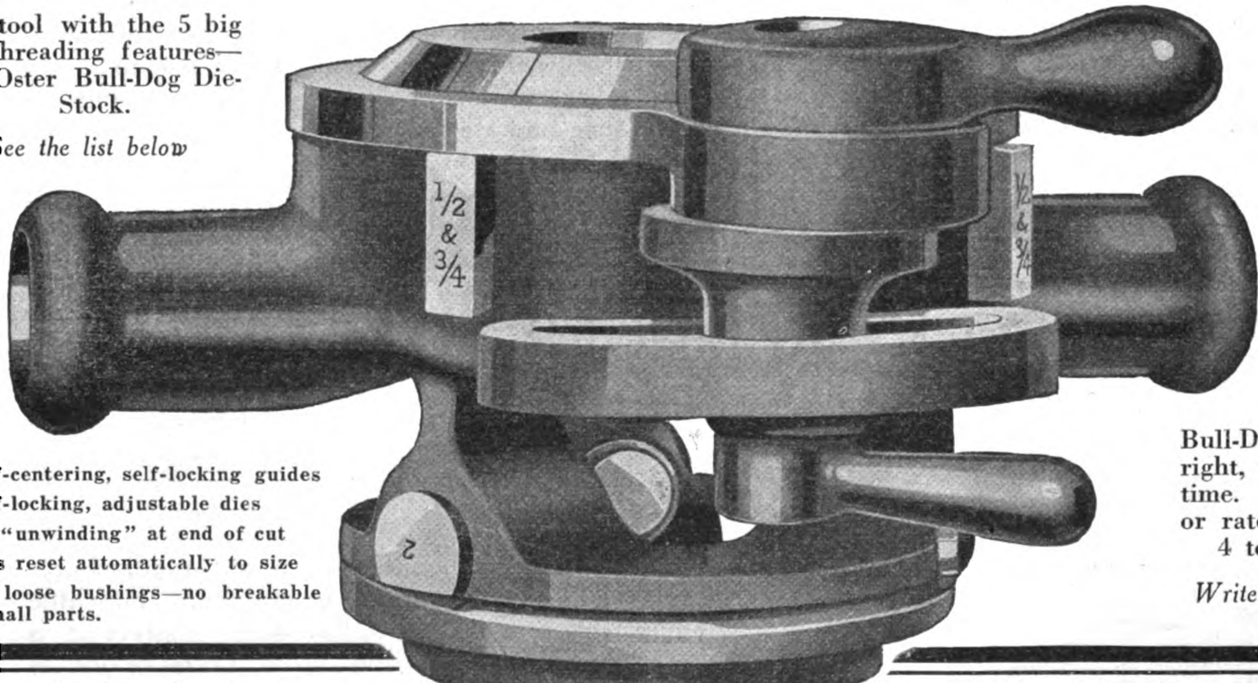

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Bull-Dog Die-Stocks make right, tight joints the first time. Eleven tools—plain or ratchet. Each threads 4 to 8 sizes of pipe.

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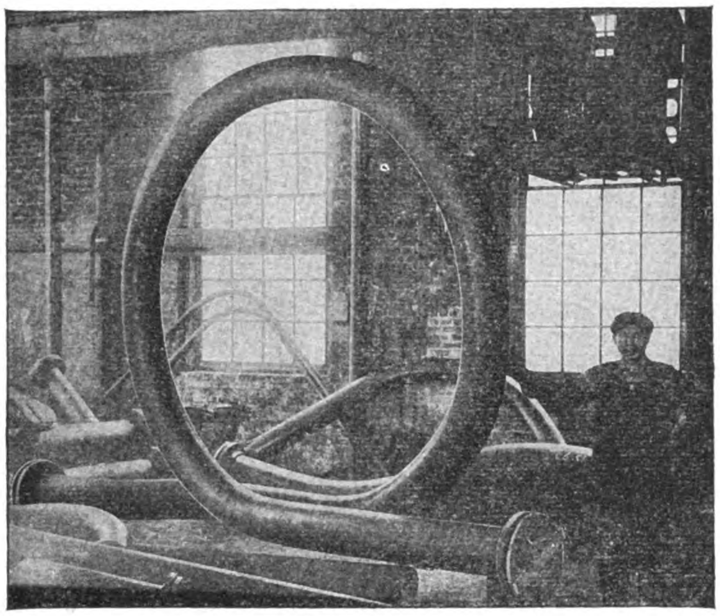

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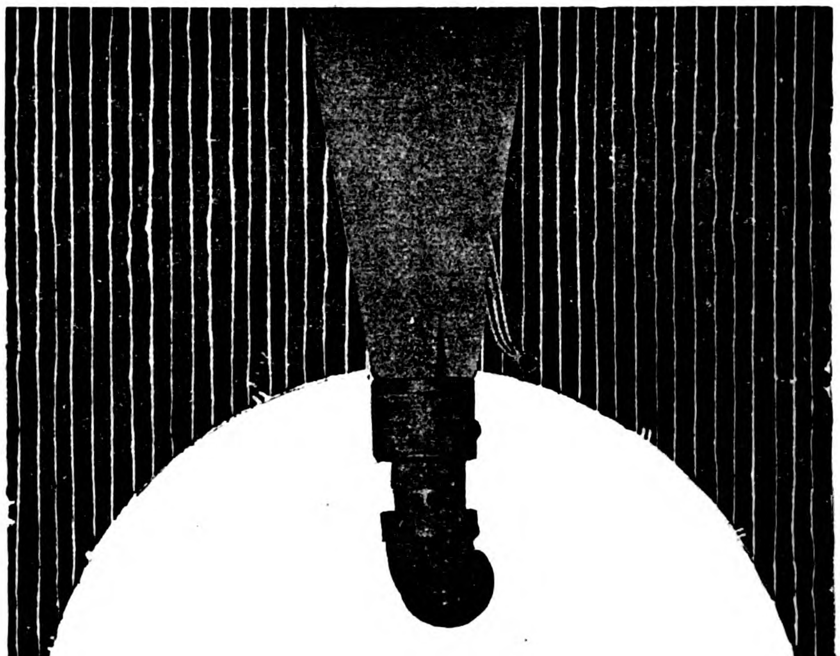

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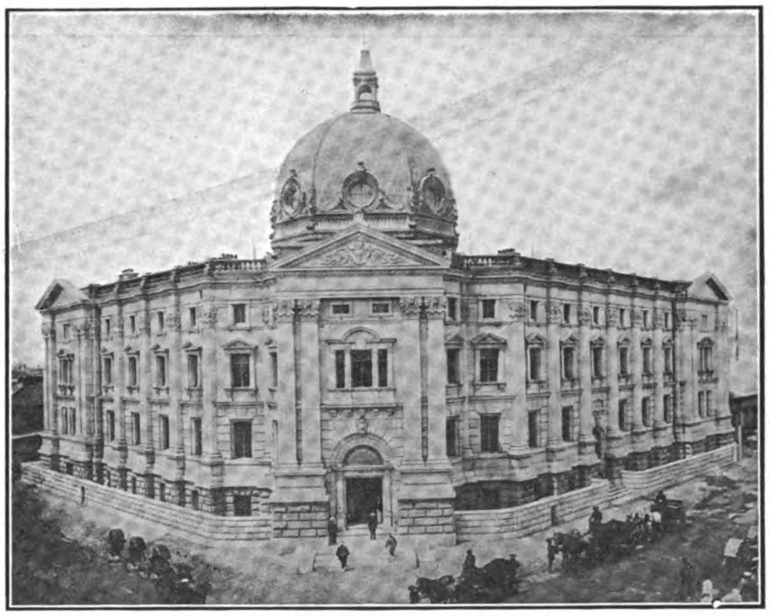

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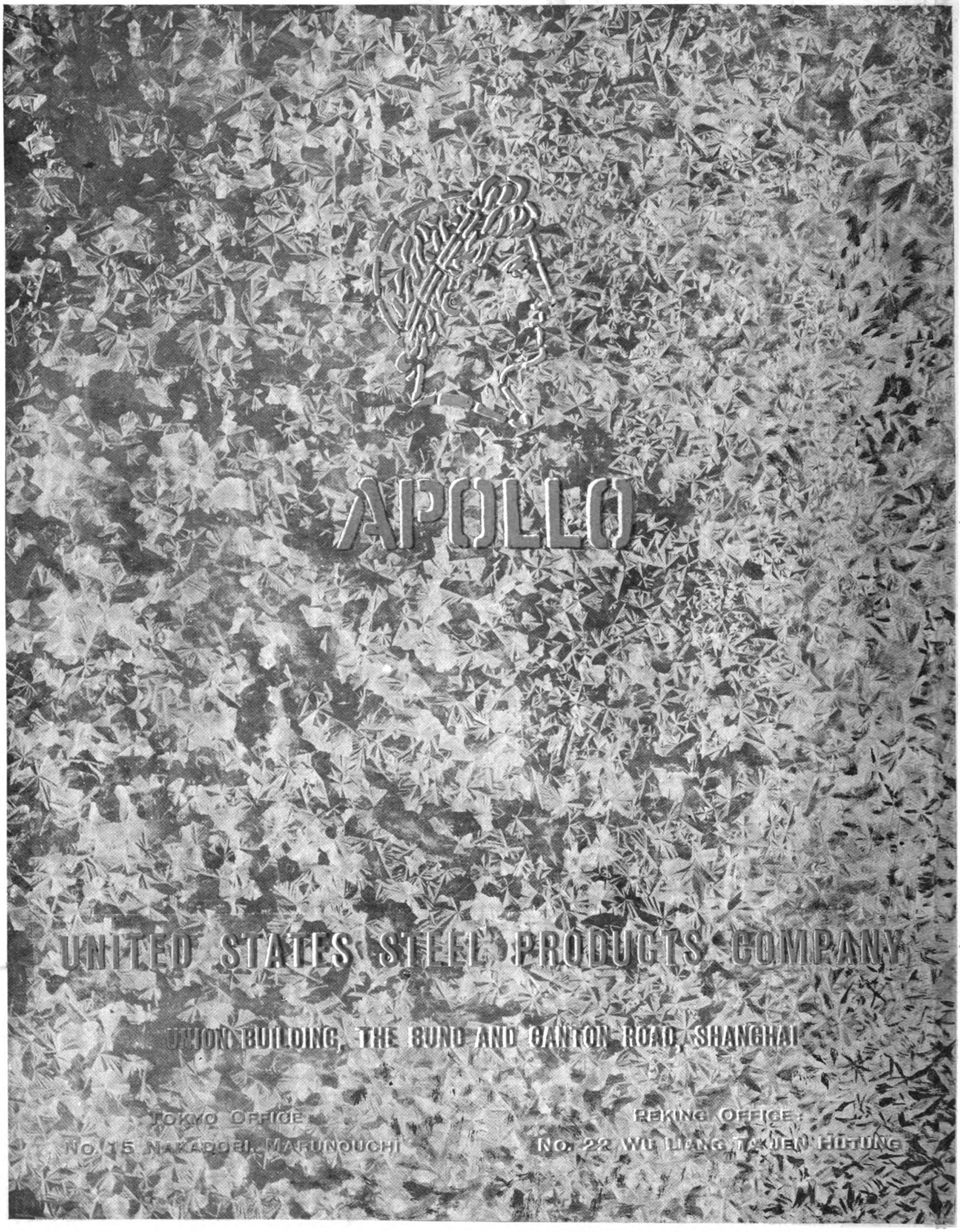

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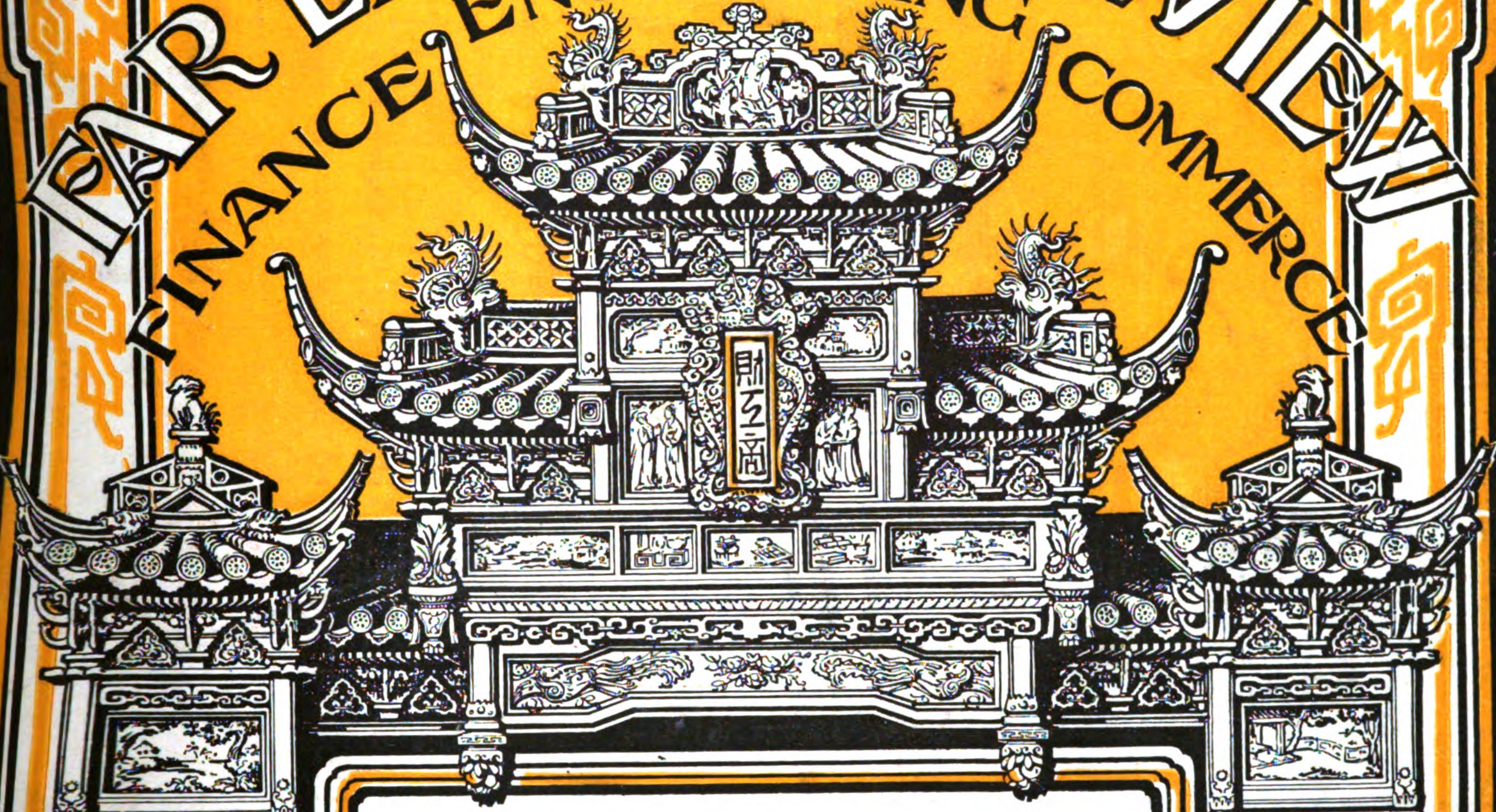

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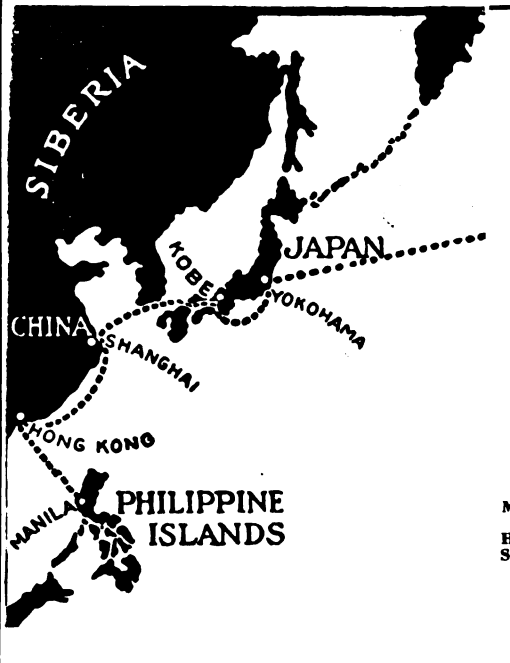

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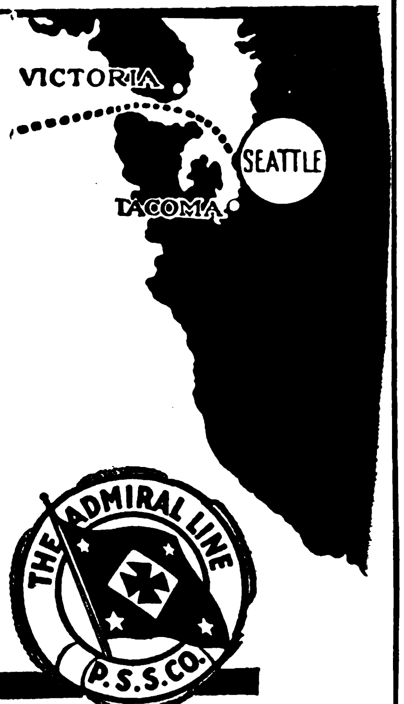

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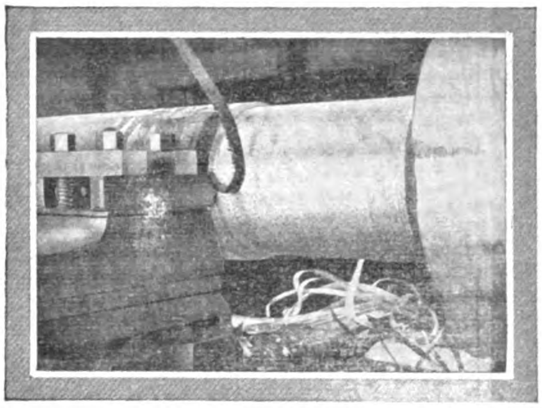

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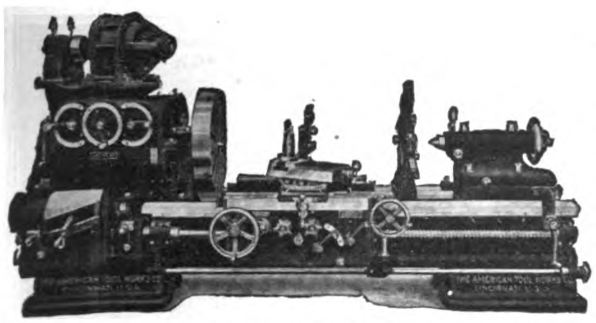

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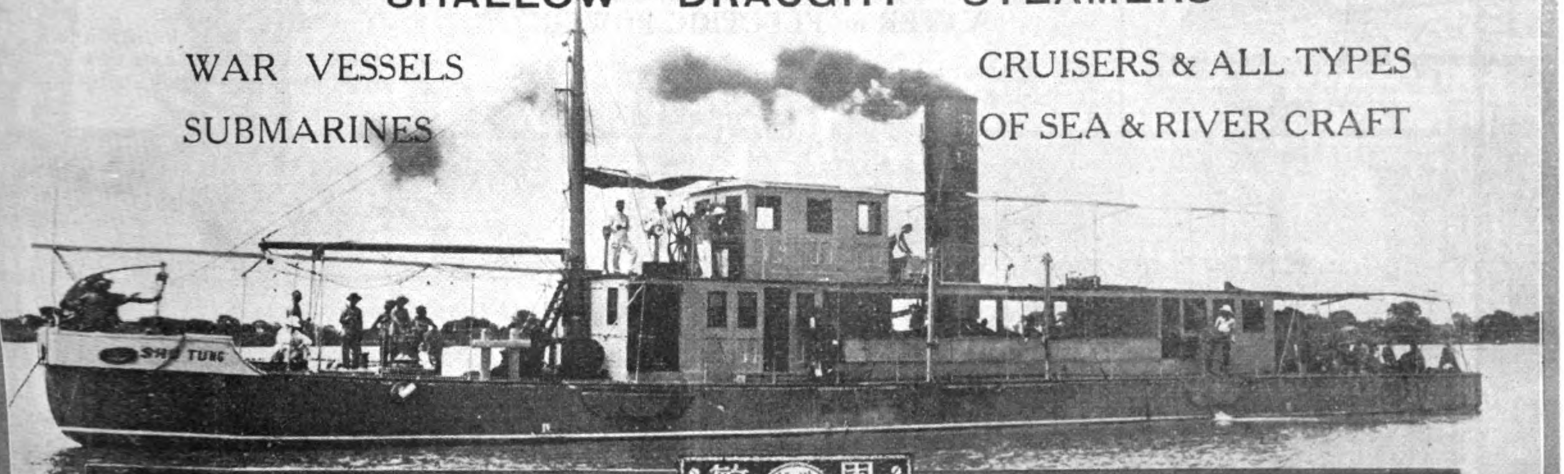

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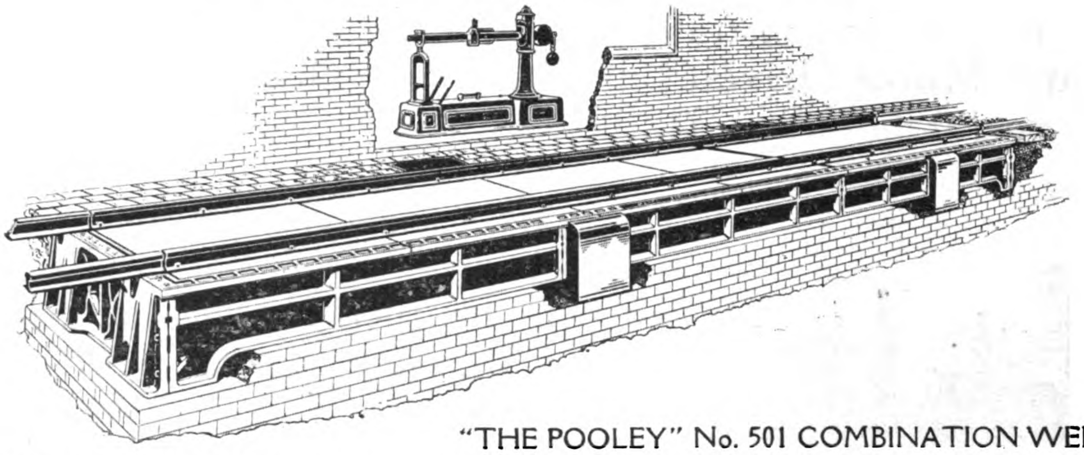

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FOR EVERY PURPOSE

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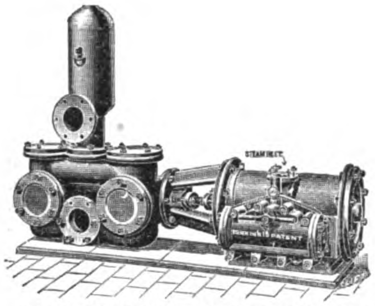

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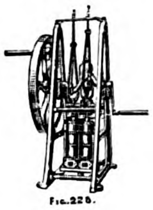
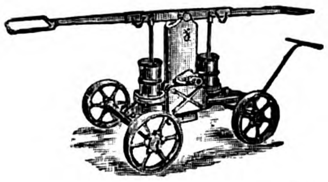
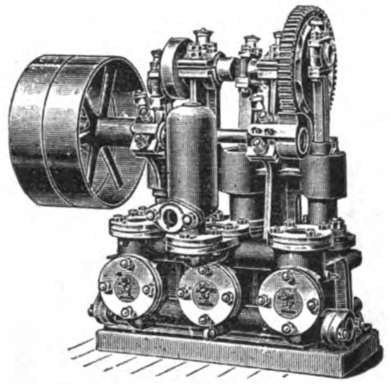


Fig. 225.

Fig. 160.





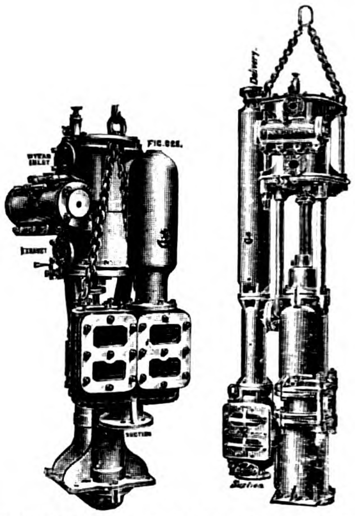


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Fig. 191.

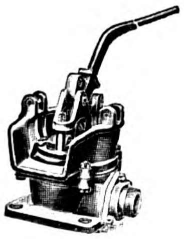

Fig. 185.

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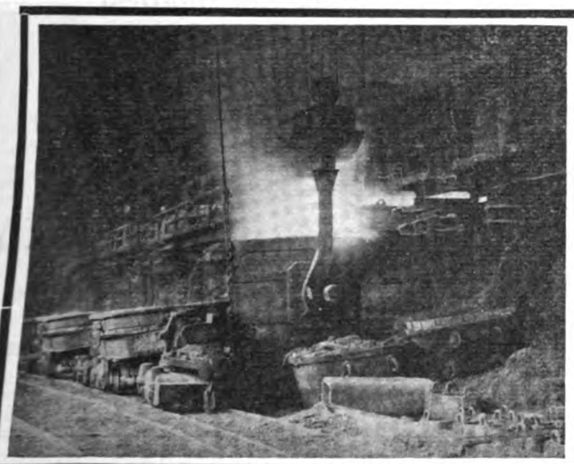

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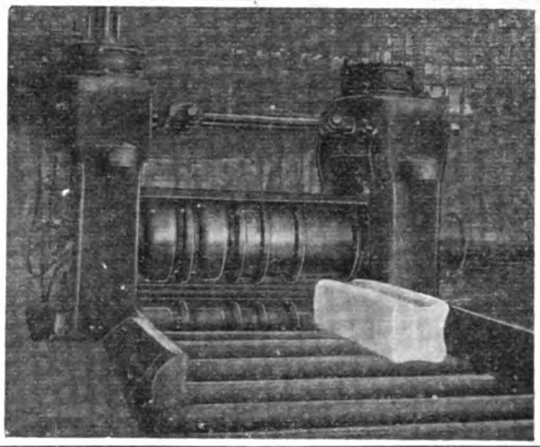

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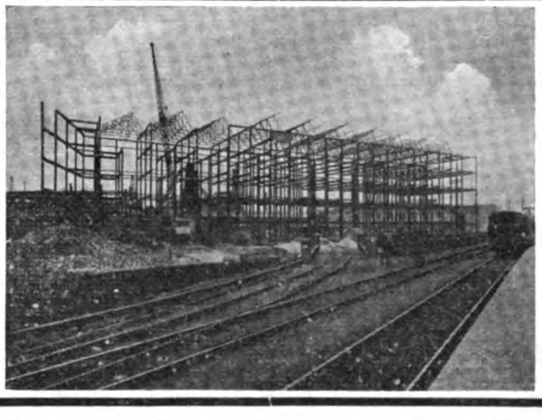

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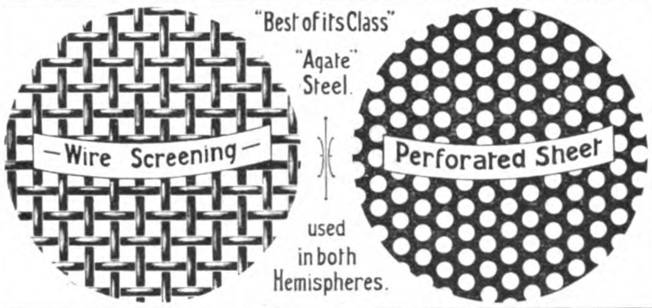

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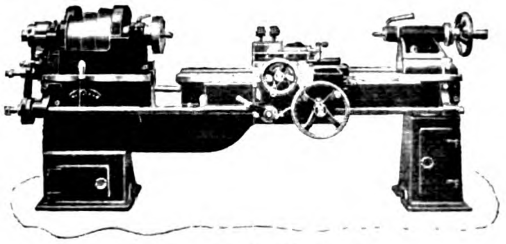

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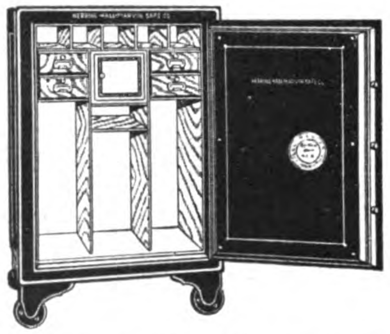

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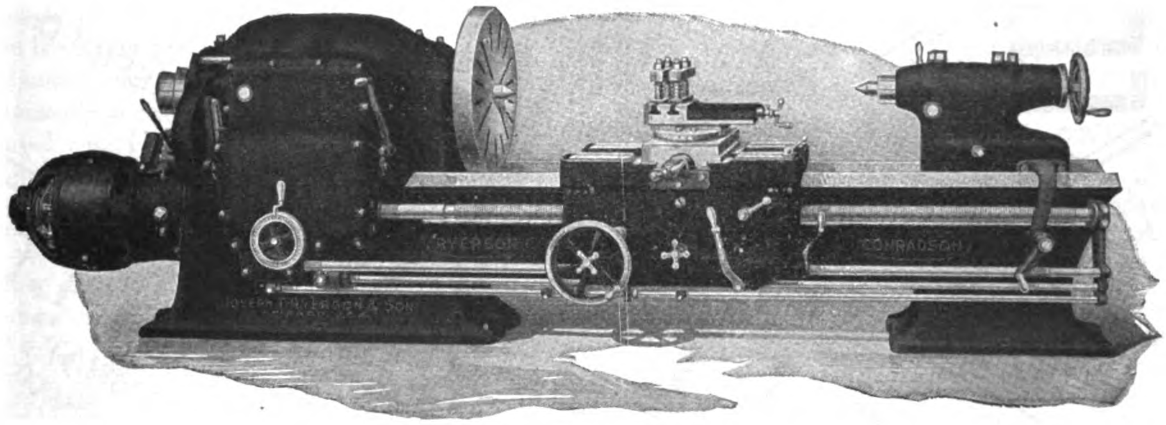

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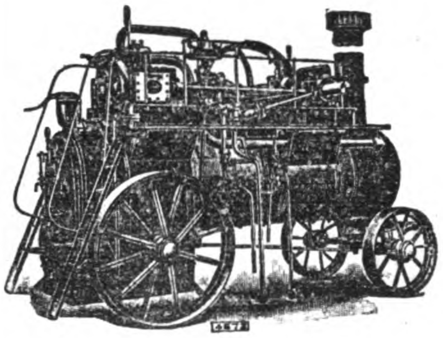

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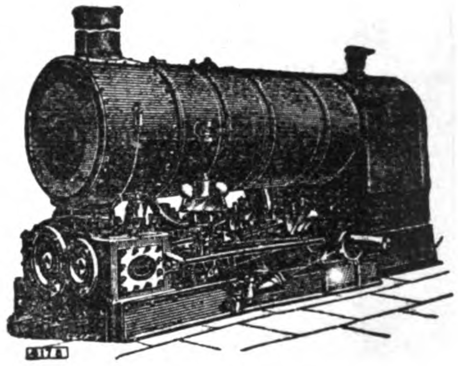

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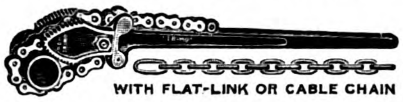

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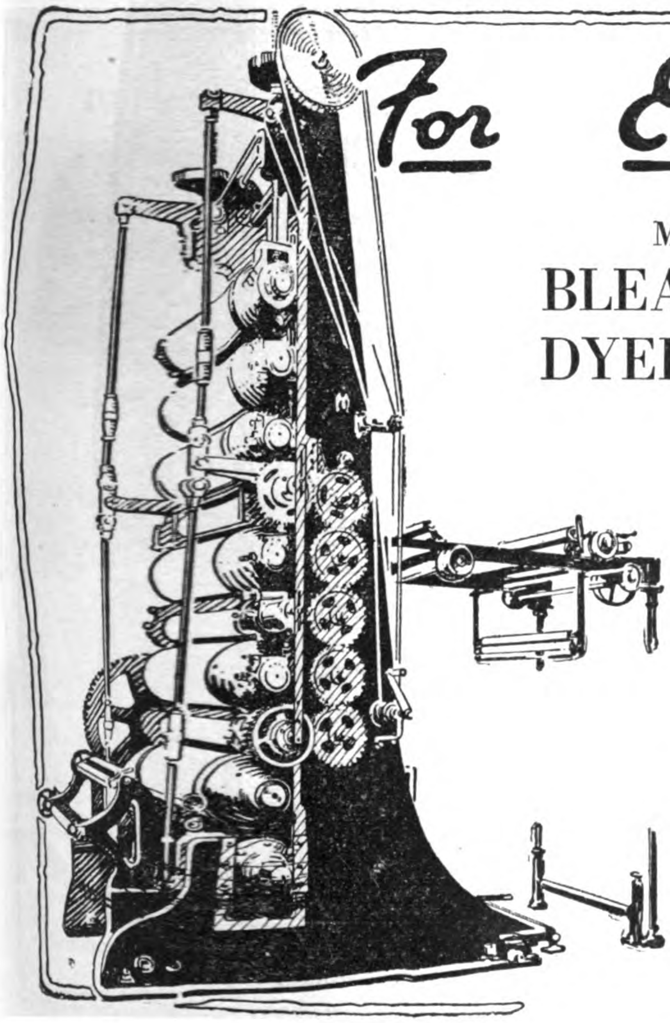

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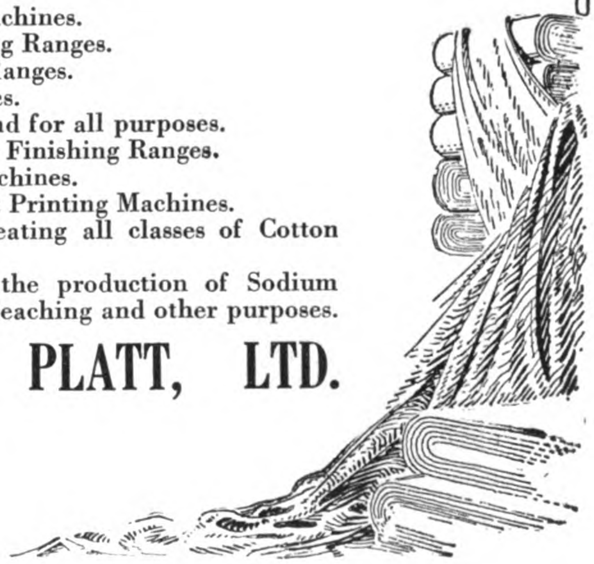

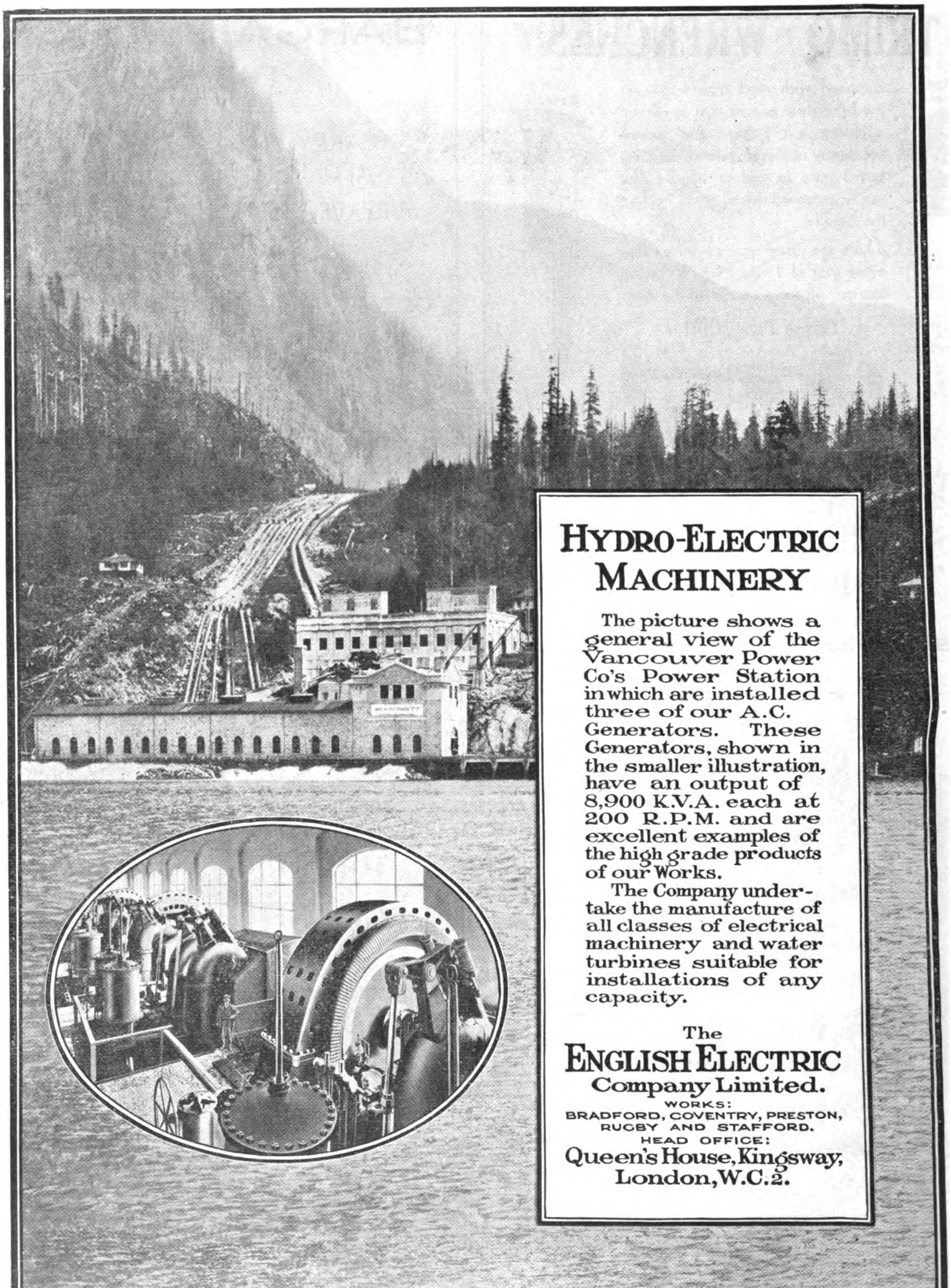

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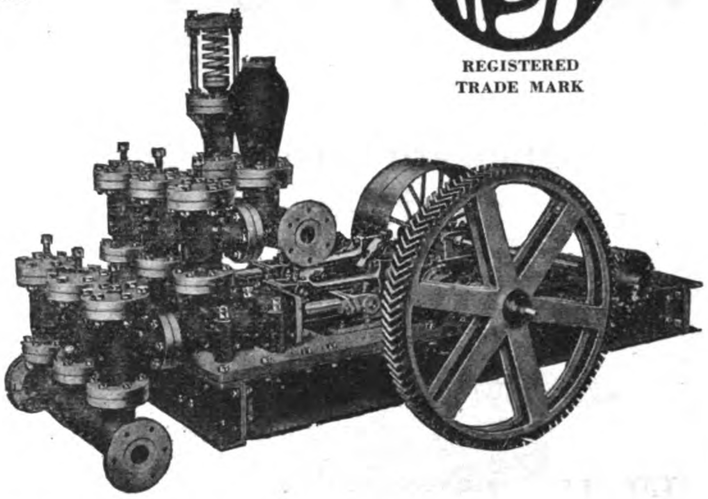

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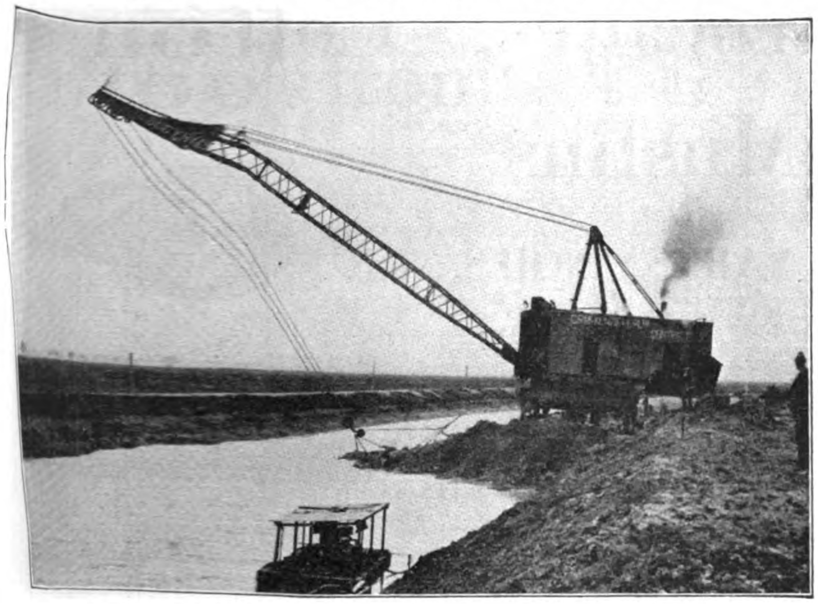

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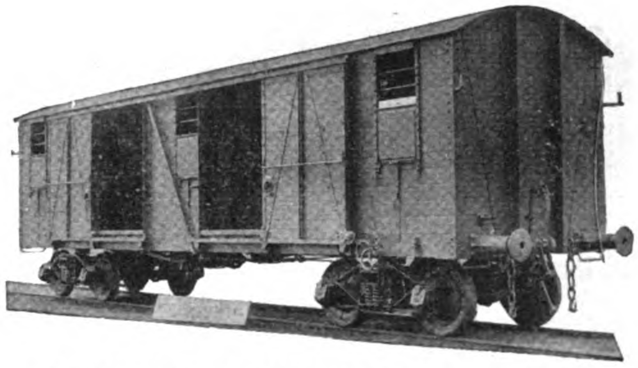

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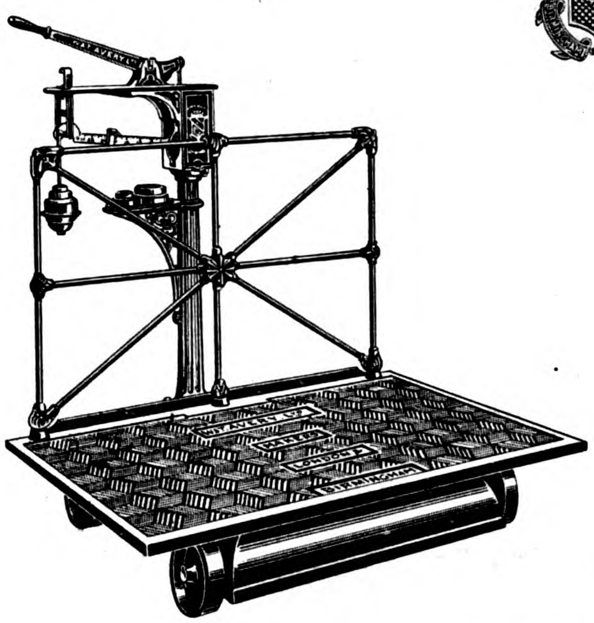

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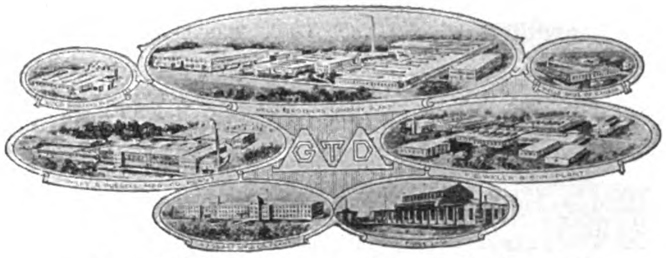

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YOUNGSTOWN SHEET & TUBE CO.

CONSTECO

TRADE MARK

LIST OF PRODUCTS

PIG IRON AND SEMI-FINISHED:

Pig iron, ingots, billets, blooms, sheet bars, skelp, slabs, and wire rods

RAILWAY MATERIAL:

Light and heavy vignole rails, tram or girder rails, cars, axles, wheels, tires, sidings, frogs, switches and crossings, forgings and castings.

STRUCTURAL AND SHIPBUILDING MATERIAL:

Shapes - joists, H-columns and other Bethlehem sections, structural channels, ship channels, angles, bulb angles.

Plates - for ships, tanks, stacks, and for boilers of flange and firebox steel, checkered floor plates, boiler heads, fronts, etc.

Bars - - round, square, flat, and hexagon—iron or steel for all purposes, including stay bolt iron and tool steel, cold rolled and cold drawn shafting, deformed reinforcing bars.

Piling - Lackawanna interlocking sheet piling.

SHEET AND TIN MILL PRODUCTS:

Sheets - plain and corrugated, black and galvanized, also blue annealed, shovel sheets, enameling and stamping stock.

Tinplate - "cokes," "best cokes," "ternplates," and tin mill black plate.

TUBULAR PRODUCTS:

Black and galvanized wrought steel for steam, gas, and water; red steam tubes, American or English standard, lapwelded steel or lapwelded charcoal iron boiler tubes, casing, tubing, drive and line pipe; conduit, rigid, flexible electrical.

FLAT STEEL:

Flat bars, bands, hoops, hot and cold rolled strip steel.

WIRE PRODUCTS:

Plain wire, galvanized wire of various grades, annealed wire, bright hard and bright soft wire, wire nails, fencing and barbed wire, wire strand, wire hoops and wire bale ties.

MANUFACTURED PRODUCTS:

Bolts and nuts, rivets, screws, spikes, turnbuckles, and washers; machinery, machine tools, and engines.

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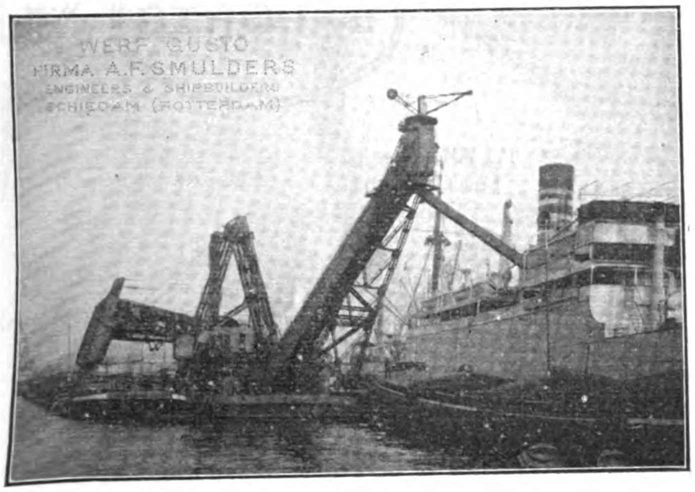

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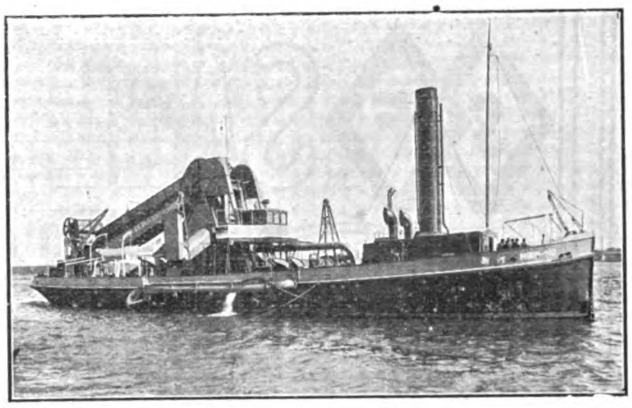
Coaling Elevator 'Westfalen' with a guaranteed contractual output of 600 tons per hour, which ran up to 1,000 tons at the trial.



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Electrolytic Copper Ingots	20,000	Tons
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Steel	50,000	,,
Coal	3,500,000	,,

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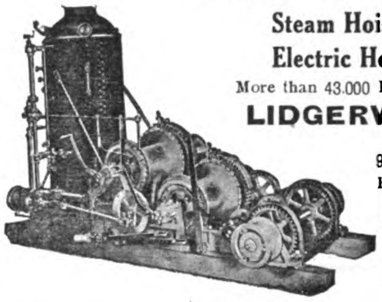

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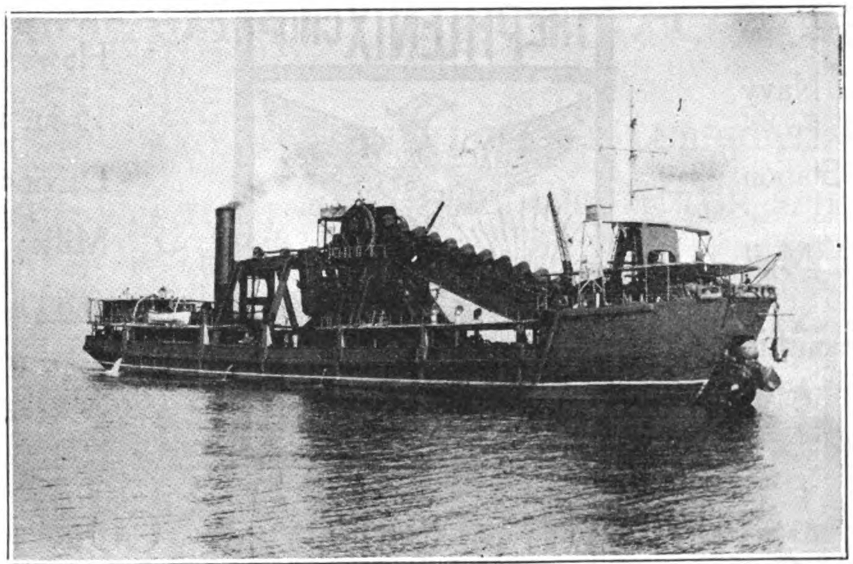

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Blooms
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Bolts and Nuts
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Shafting
Shapes—Standard Structural
Sheet Bars
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Skelp
Slabs
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Sleepers—Steel
Spring Steel
Steam Pipe and Tubes
Stove Pipe Skeebs
Switchs—Switch Stands
Tank Plates
Terne Plates
Tin Mill Products
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Tool Steel
Towers—Steel
Triangle Mesh Concrete Reinforcement
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President:
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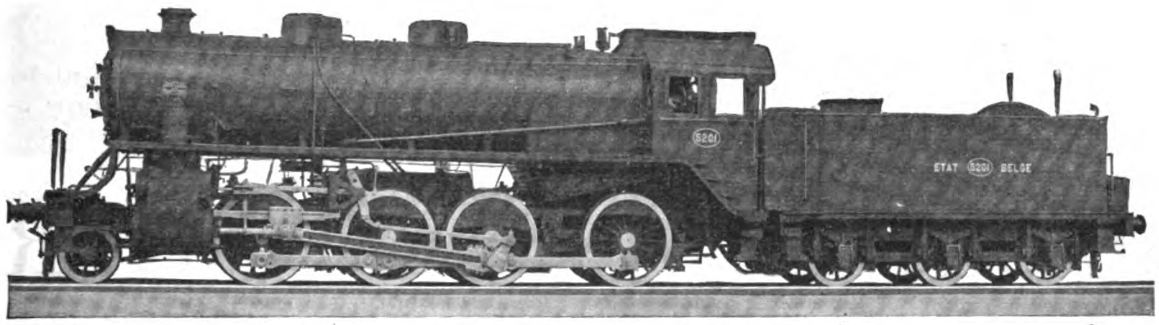

BUILT FOR THE BELGIAN GOVERNMENT

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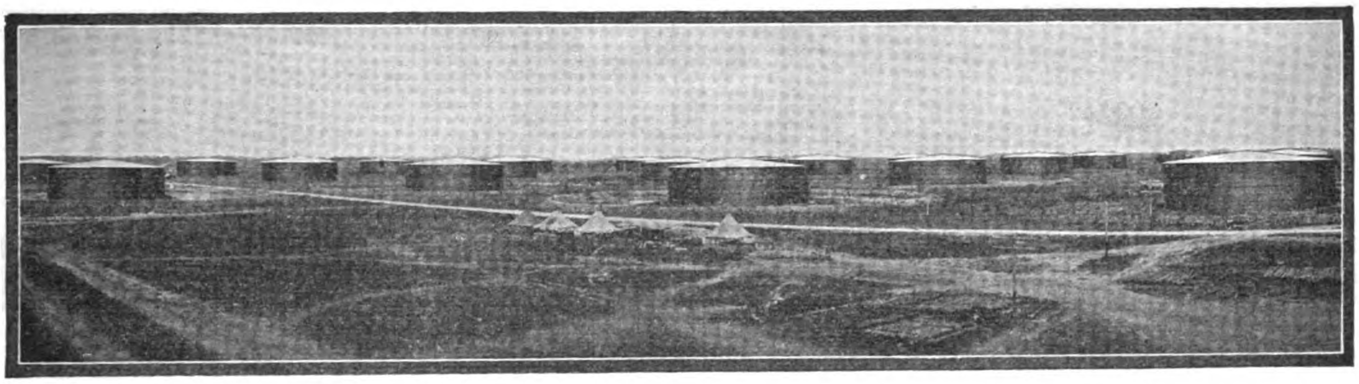

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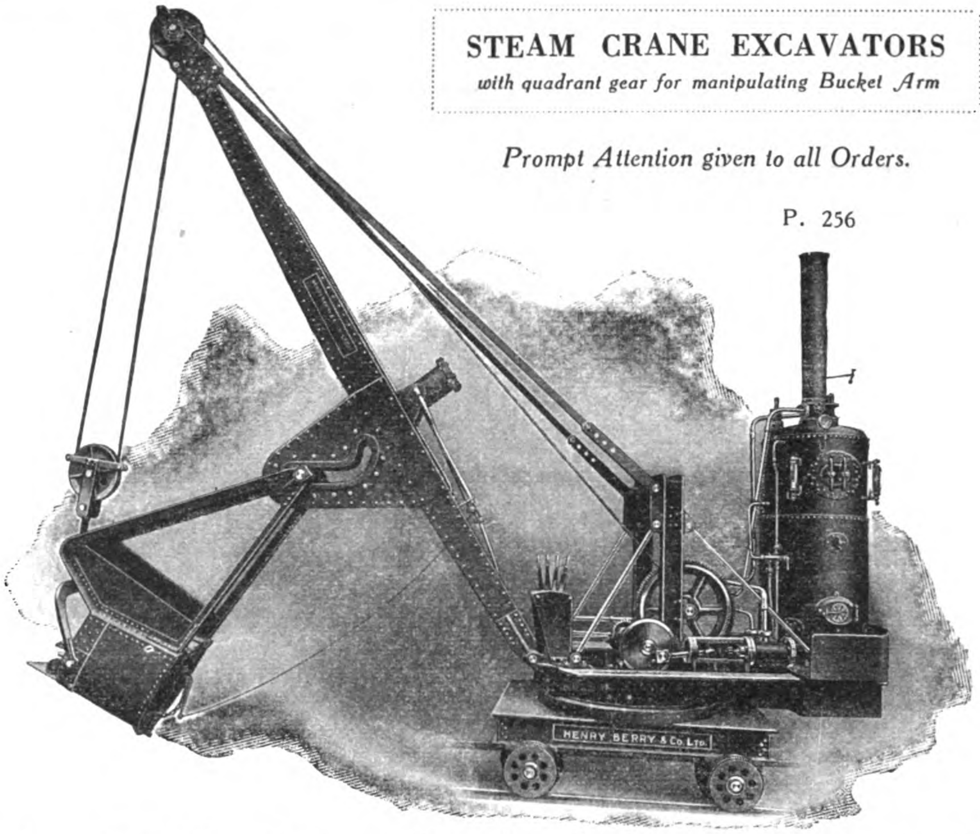

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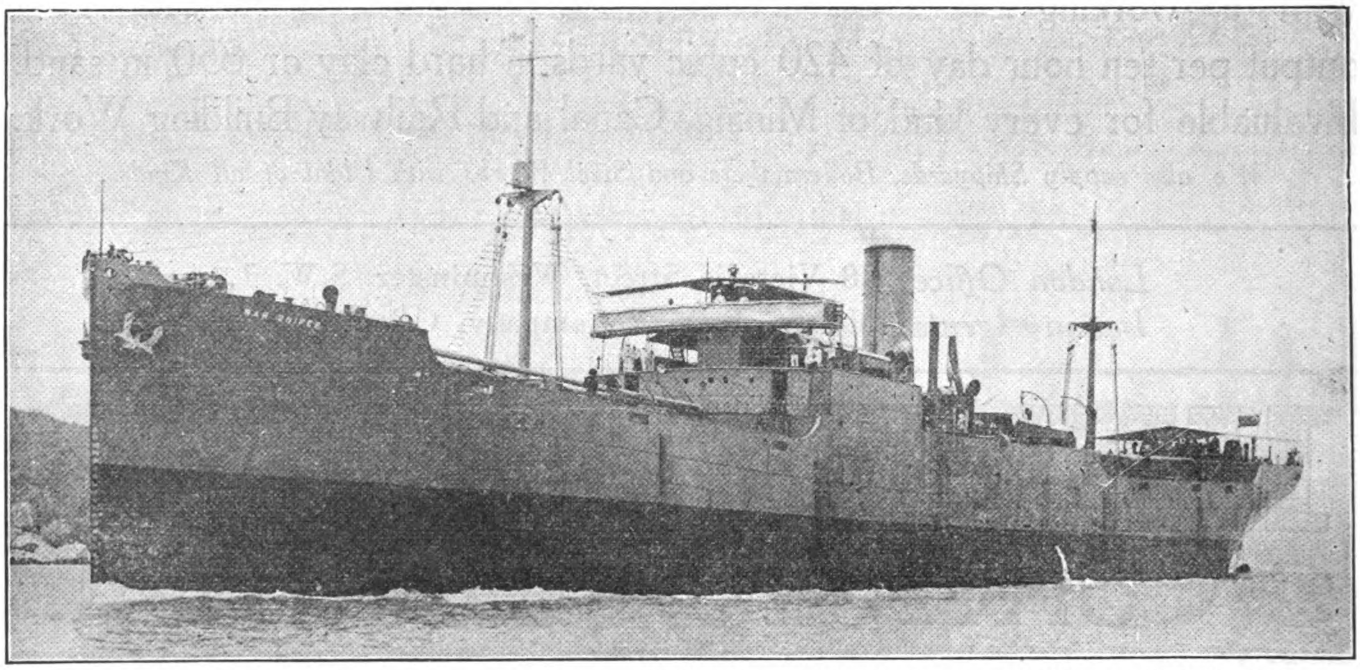

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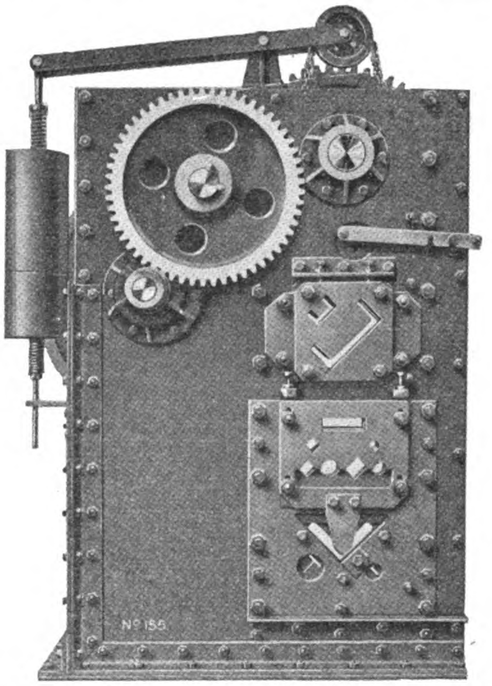

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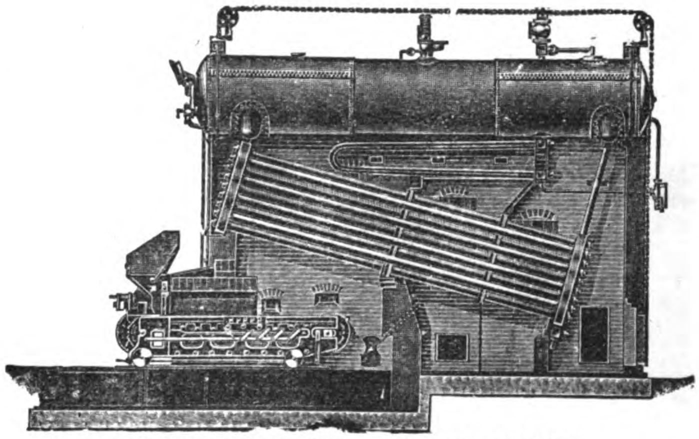

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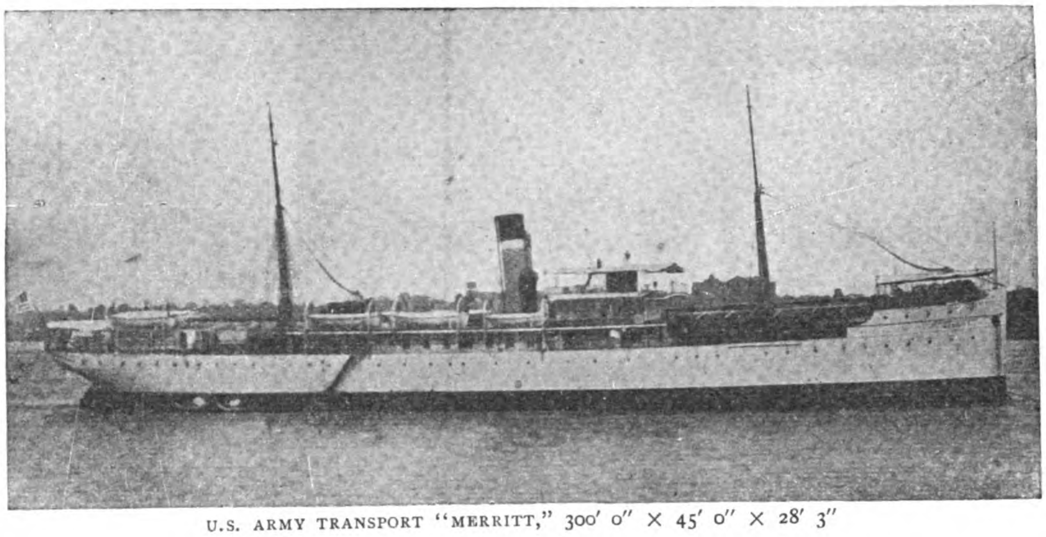

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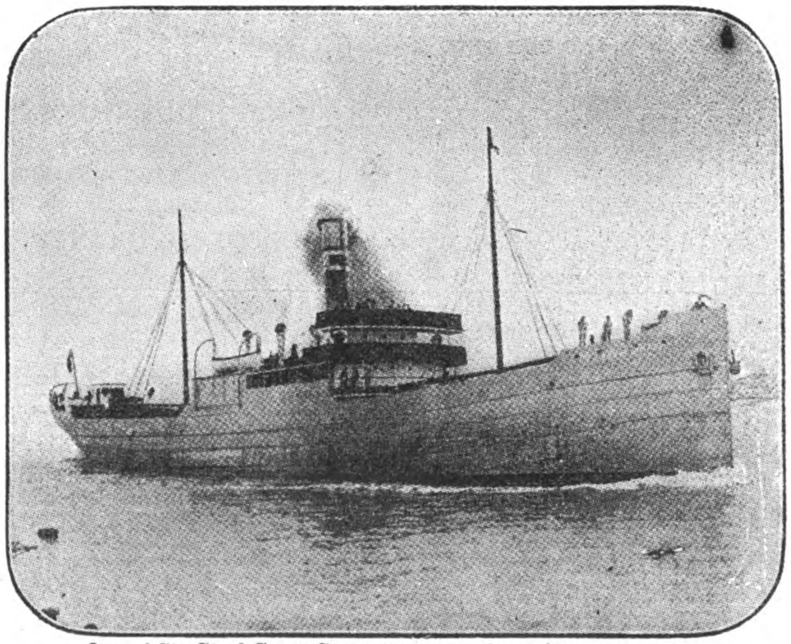

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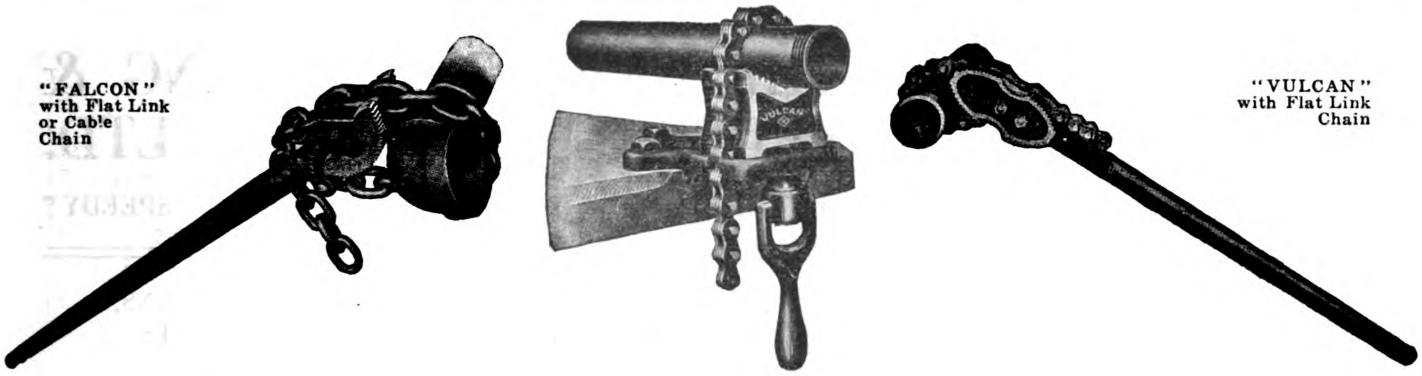

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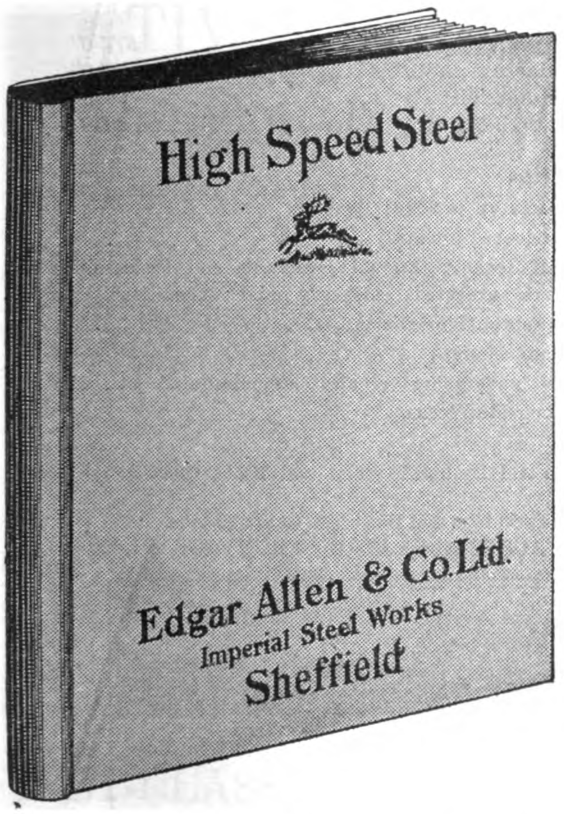

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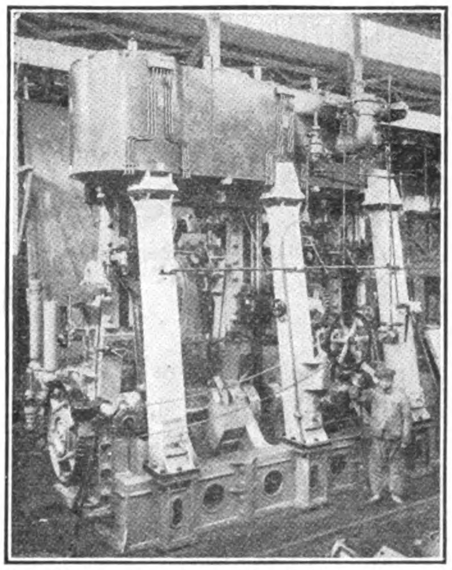

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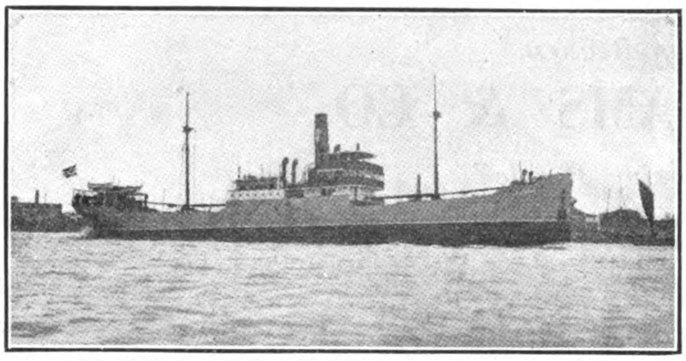

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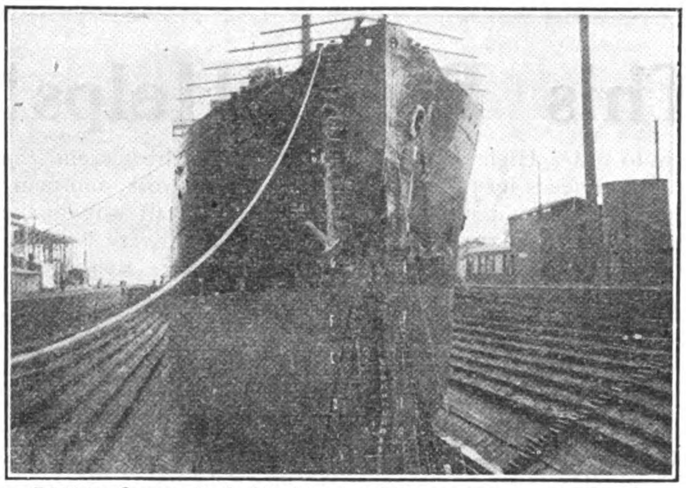

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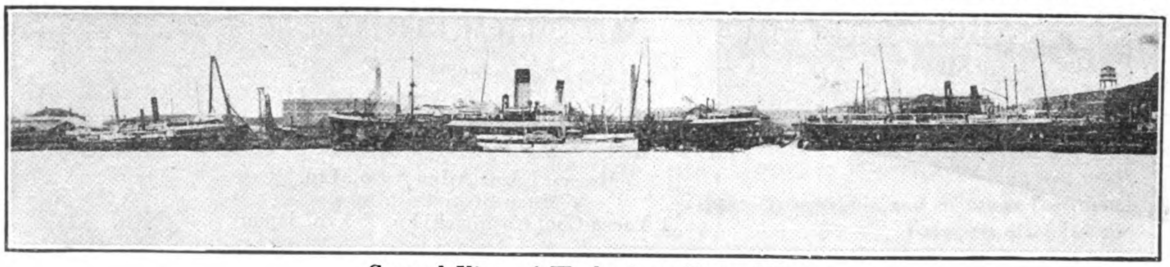

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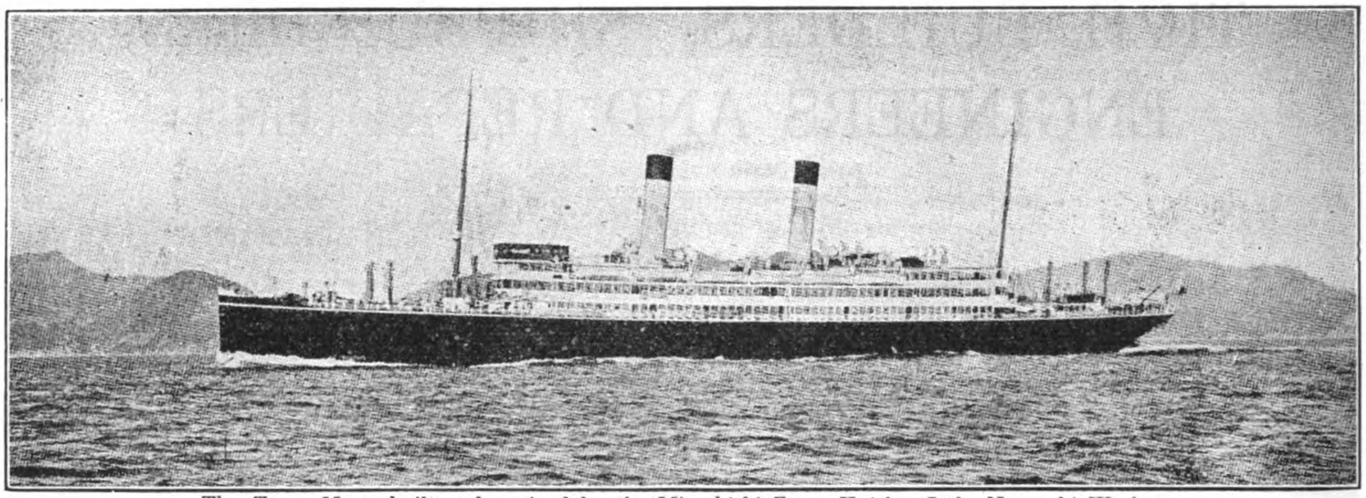

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SUBSCRIBED CAPITAL - - Yen 5,000.000
PAID-UP CAPITAL - - - „ 1,250.000

Branches and Agencies:

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(MITSUBISHI SOKO KAISHA, LTD.)

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Head Office: MARUNOUCHI, TOKYO

Branches: TOKYO, YOKOHAMA, KOBE, OSAKA AND MOJI

General Managers of the

KYODO UNYU KAISHA

YOKOHAMA

3 KAIGAN-DORI, ITCHOME
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VALUE OF GOODS IN WAREHOUSE (latest date) - - - Yen 275,000,000
CAPITAL (PAID UP) - Yen 5,000,000; RESERVE FUND - Yen 3,098,400

President: TOKUEMON MITSUI
Managing Directors: S. YADA and H. OKUMURA
Directors: K. HAYASHI and K. FUKUI
Auditors: T. MITSUI and T. MAJIMA

HEAD OFFICE: No. 5 HONKAWAYA-CHO, NIHONBASHI-KU, TOKYO

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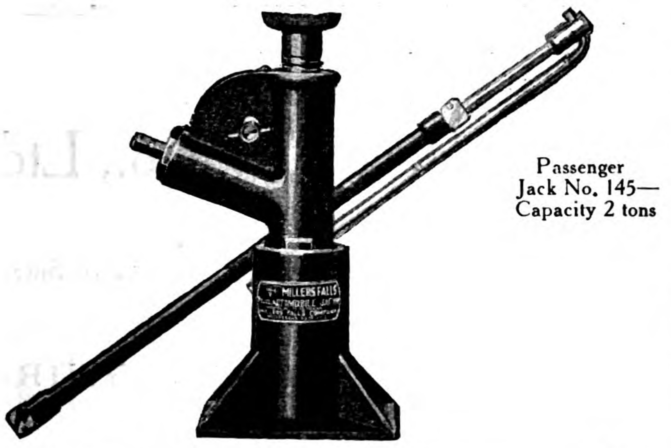
OSAKA—Nakanoshima, Nishi, Utsubo, Aji-kawa, Nishinari, Sakurashima Chikuko
YOKOHAMA—Shinko-cho
KOBE—Kano-cho
MOJI—Hama-cho
SHIMONOSEKI—Kannonzaki-cho



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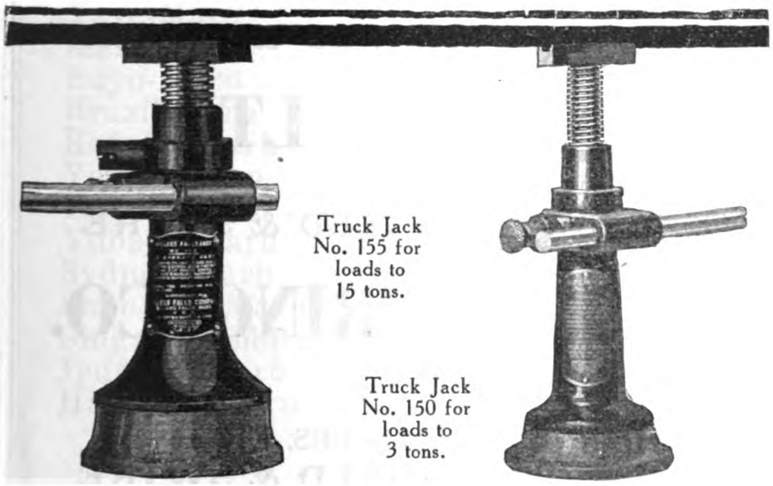

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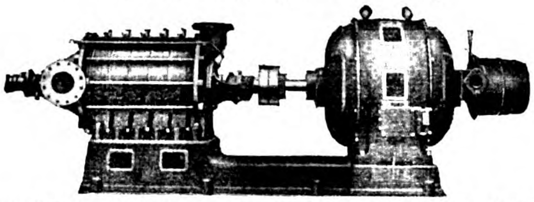

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KOKUSAI KISEN KAISHA

Nominal Capital	- -	Yen 100,000,000.00
Paid-up Capital	- -	,, 87,500,000.00
Aggregate Tonnage	- -	500,000 Tons

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Tofuku-Maru	9,100	Kashu-Maru	8,800
Chifuku-Maru	9,100	No. 2 Kifunesan-Maru	5,000
Ryufuku-Maru	9,100	Yousan-Maru	5,000
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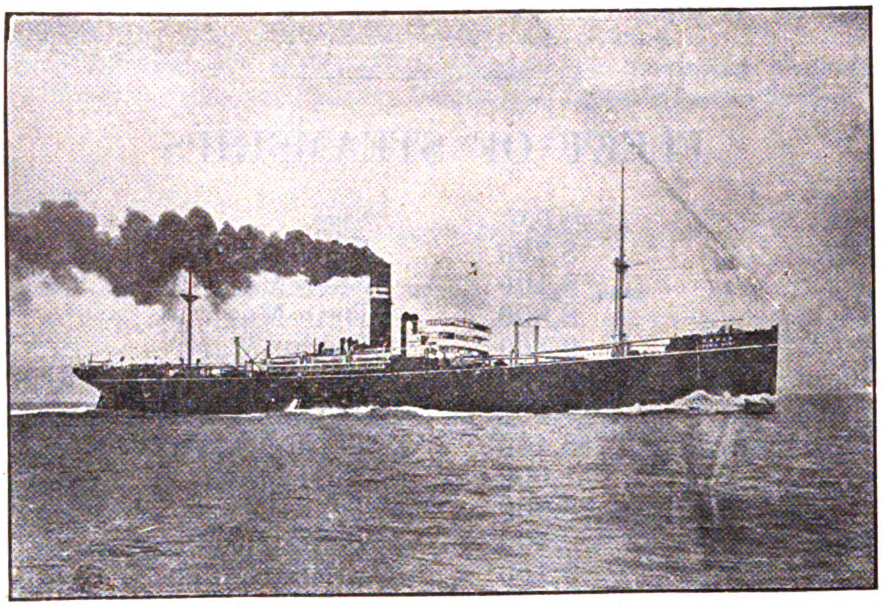

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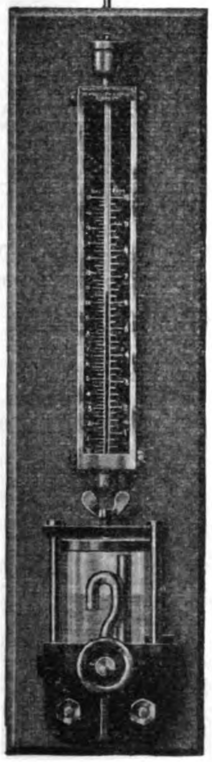

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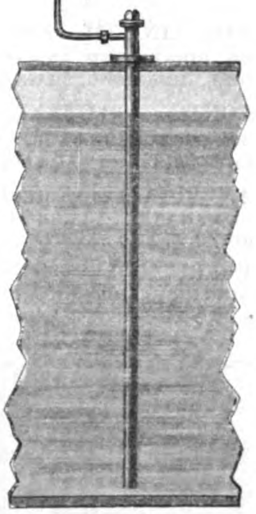

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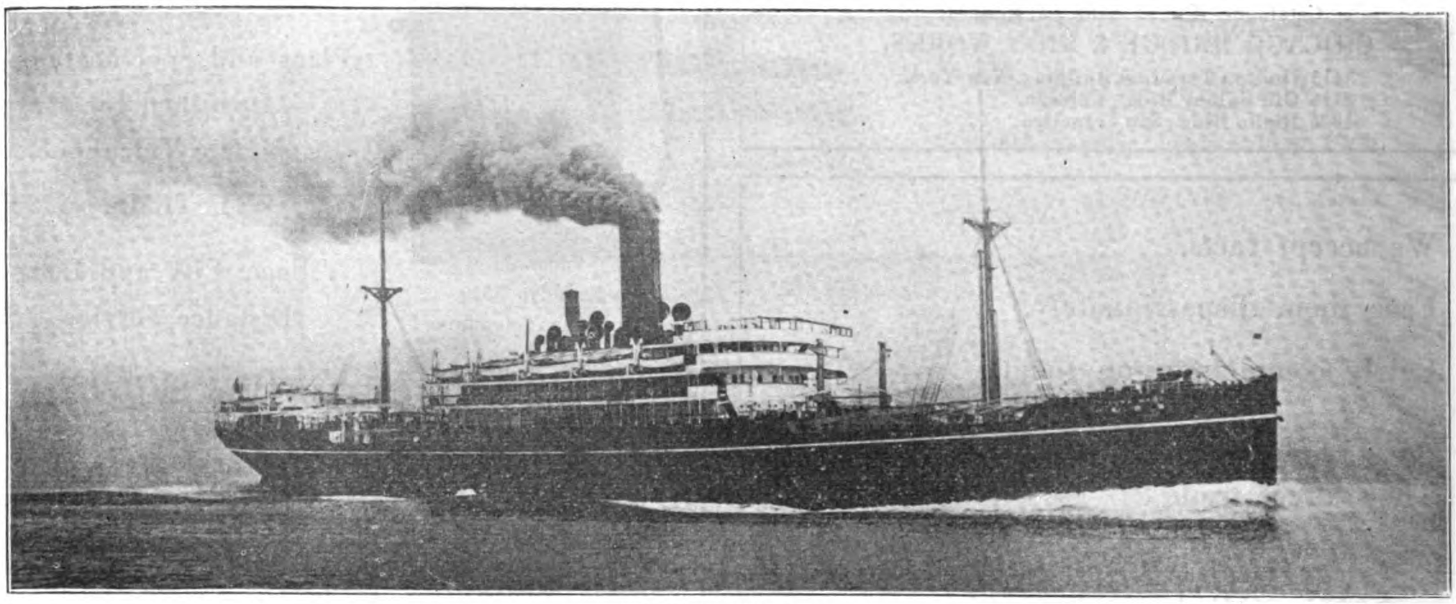

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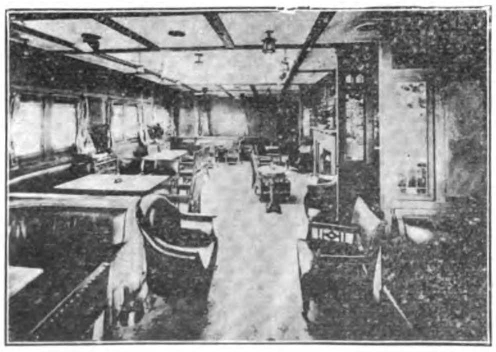

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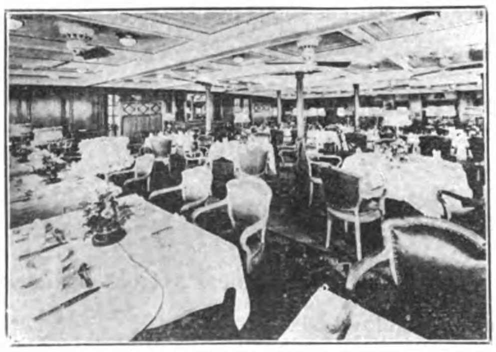

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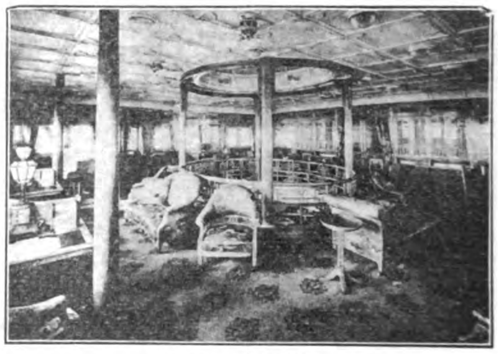

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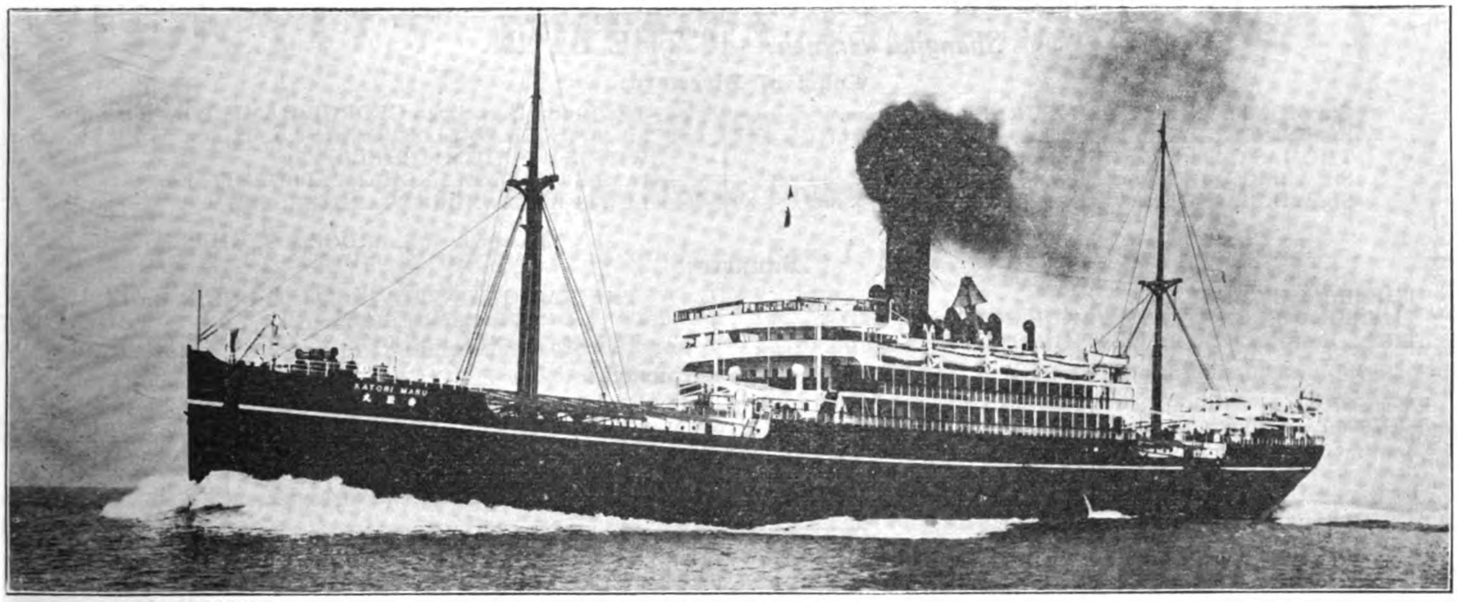

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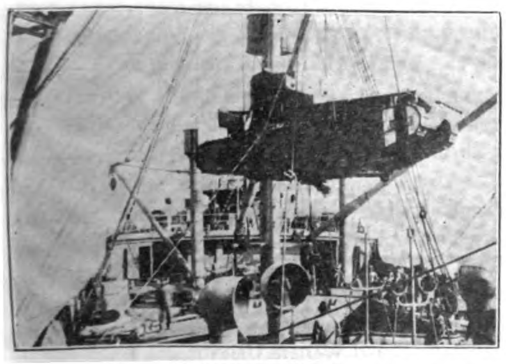

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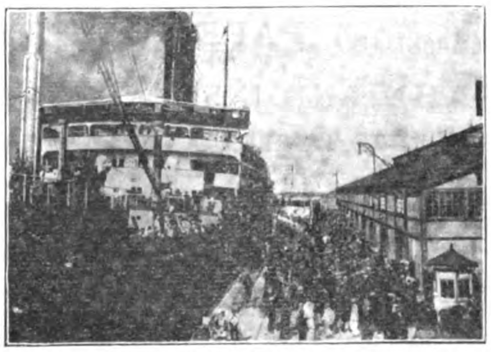

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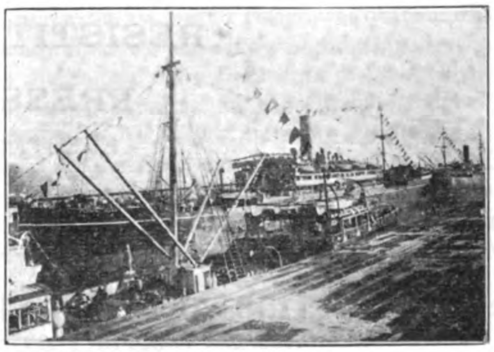

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The Far Eastern Review

ENGINEERING FINANCE COMMERCE

VOL. XVIII SHANGHAI, MARCH, 1922 No. 3

TOKYO'S PROJECTED SUBWAY

THE TRANSPORTATION PROBLEMS OF JAPAN'S CAPITAL

Plans and Prospects of the Tokyo Underground Railway Co., Ltd.

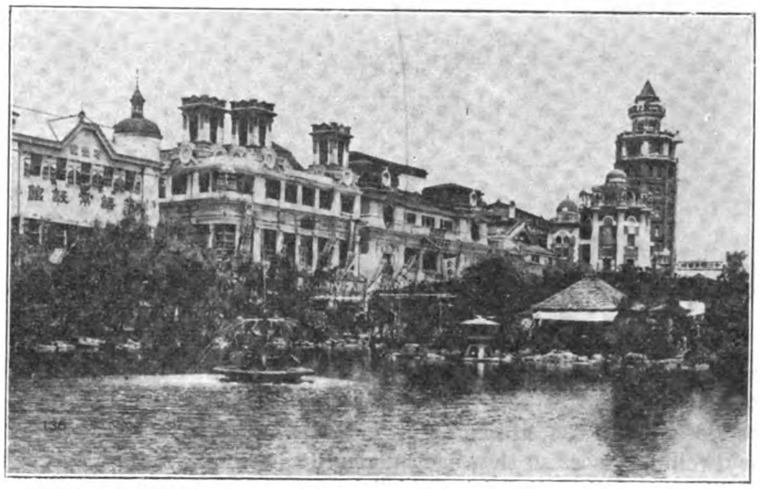
By H. C. Hugins, Professor of Economics, Keio Gijuku University, Tokyo, Japan.

TOKYO, the fourth city of the world to-day, stands in the most dire need of the immediate construction of some kind of rapid transit system which will solve its almost desperate transportation problem. The Japanese people, although they keenly feel that something is very wrong with transportation equipment in the big towns and cities, are unfortunately so geographically isolated from the developments of Europe and America, that they are slow to realize that for many years past, such systems have been in successful operation abroad, and they are slower still to demand improvements in the present ramshackle and broken-down system which no longer even make a pretence of being adequate to serve the ever-growing populations of the urban centres.

A distinction between country and city, urban and suburban, is not yet acutely drawn in Japan. Office districts and residence districts are not distinguishably separated, and business is carried on in the homes of many tens of thousands of Tokyo residents. In consequence of this lack of distinction between "up" and "down" town the greater number of persons, who crowd to the utmost limit of endurable capacity the trams of the Tokyo municipal railway bureau from morning till night, is principally made up of national and municipal officials and clerks, students, laborers and clerks in private employ, going to and coming from their day's work. Women in Japan are conventionally expected to have little to do outside their own homes, so there is little, if any, need for them to use the city tram lines to travel about in. The common people walk, and that well-to-do ride in ricshas, or automobiles. It is most noticeable that it is the middle class alone to whom the doubtful pleasure of riding in Tokyo trams is to-day almost exclusively confined. Resulting from these conditions the Tokyo municipal railway system carries only a very small part of the population of the city. In Paris the average number of rides each resident of the city makes each year is 230, in Tokyo, where population is equal to that of Paris, the average number of rides is only 113 a year.

ASAKUSA PARK. TOKYO'S GREAT PLAYGROUND, LOCATED AT THE EXTREMITY OF THE CAPITAL, ATTRACTS HUGE CROWDS DAILY; A TRANSPORTATION PROBLEM OF THE FIRST MAGNITUDE

The shopping street, where wheeled traffic is prohibited, leading to the Kwanzeon Temple in Asakusa Park



A part of the Amusement Centre of Asakusa Park, showing the 12 story pagoda

Up to a few years ago, ever with all its inadequacies of equipment, the surface transportation system in Tokyo was quite complete enough for the uses made of it by the city's population, but now, since the great growth of the city from the influx of labor with the years of war and post-war prosperity, in the Ginza district (the retail district), in Marunouchi (the new banking centre), and in Nihonbashi (the wholesale district), many large office buildings built in the past five years, attract tens of thousands of persons every day. They must all use the city's trams twice a day, at least, to carry them to and from their work. Women are now even leaving the home to take employment as clerks, and where ten years ago one woman rode on the trams in company with fifty men, to-day the number of each sex using them is almost equal. The old systems are bending under the strain of modern industrialism, systems both of transportation and society, and can no longer bear without cracking the demands made upon them.

It is no exaggeration to call the Tokyo municipal railway system hoplessly antiquated. The operation of the trams is simply atrocious: the actual condition of the trams themselves is almost beyond the ability of those who do not have to come in daily contact with them to comprehend. And with all this the whole future of the capital city of Japan, Tokyo, depends upon an immediate betterment, and extension of the present system. Even the Japanese people, so unused to consider time of any importance in their lives, are waking up to the fact that some rapid way of getting about Tokyo's streets is essential to the city's progress, and their own comfort and welfare.

Official Plans for a Greater Tokyo

Just at the present moment the Tokyo municipal authorities and a few influential citizens in close touch with official activities are loudly advocating a greater Tokyo, without any very clear idea on their part of what a greater Tokyo actually means, or what will be required to bring it about. It is not pessimism, but the teaching of the actual facts which makes it evident that a greater Tokyo is a practical impossibility unless a radical change takes place in the city's transportation systems.

The boundaries of Tokyo municipality enclose an area of 300 square miles, 837,972,000 square feet, the population of the municipality was estimated at 2,330,000 in 1921; each person in the city would have 360 square feet in which to dwell. In Paris and Berlin populations are about the same in density, but those cities buildings are from six to ten stories high, and this added space is available for dwelling places so that each person has a much greater average dwelling place than the citizen of Tokyo.

The international conference of insurance men held in 1908 expressed the opinion that it was impossible to safeguard the health of city dwellers where the space potentially available for each individual was less than 1,440 square feet. If this is taken as a standard, the population of Tokyo is living in very unhealthy surroundings indeed; while in the city's present area, it is utterly impossible to maintain the health of the present population, let alone an ever growing one. Even if Tokyo were adequately equipped with water supplied from central reservoirs, and even though a modern sewage and drainage system were installed, along with many other improvements needed to make it a thoroughly sanitary modern city, in the present limited space the municipality is crowded into, it is impossible to expect individuals to live in perfectly healthful surroundings.

The greater Tokyo plan contemplates making the district lying between Tokyo central station in Marunouchi, and Nihon Bashi (the bridge not the district called Nihonbashi), the centre of the new city which will extend outward in a circle having a radius of ten miles. This very ambitious plan has been advocated and almost adopted without any consideration having been given the city's urgent transportation needs. To go from any part of the circumference of this ambitious circle to the centre of the greater Tokyo takes, on the present tram lines, at the very least one hour and a quarter. In this day, even for a Japanese business man, to spend two hours and more a day on the trams between his office and his home is entirely too much of a good thing, and the business men know it. In this day of hustle and bustle, which has even slightly infected Japan, it is impracticable to live farther away from a city's centre than a half-an-hour's easy ride. Practically, as well as theoretically, half-an-hour is about the limit of travel a city's farthest boundary may be from its business centre.

In London, present transportation systems enable the business man to travel to his work at a speed of four to ten miles in half-an-hour. In Paris he can cover from four to eight miles in the same time. In New York the speed of trains is from four and a half to eleven miles, and in Chicago from five to seven miles in half-an-hour. In Tokyo there are no other cheap, means of getting about than those offered by the municipal surface tram lines, so that it is impossible to cover more than three and a half to four miles in half-an-hour. That is the theoretical speed of Tokyo municipal trams, but because streets are crowded with other vehicles, trams are outrageously delayed in their running times, and they are, in practice and then but seldom, able to cover more than six miles an hour. It is not difficult to conceive that a greater Tokyo with no more than the present transportation systems at its disposal will be very much of a dismal failure.

VIEWS ON THE GINZA, TOKYO'S MAIN BOULEVARD

Matsusakaya Department Store

The Ginza, looking North

Inadequacy of Surface Lines

Tokyo municipal railways to-day are in a hopelessly confused muddle, badly routed, badly operated, and crowded beyond endurance every hour of the day and night. With a population equal to that of Paris Tokyo has only 180 miles of surface lines, while in Paris there are 1.020 miles of surface lines. The difference is too great for the Japanese to contemplate with any equanimity. As overcrowding is the most visible shortcoming of the municipal service, it is popularly supposed that all that need be done to improve the service is to increase the number of trams operated regardless of the fact that the present, track, wire, and power house equipment makes any increase in the number of trams operated a physical impossibility. Theoretically the track and power equipment will operate a maximum of 12 trams on each mile of single tiack. Even if it were possible to increase the number of trams on each mile of track to fourteen by despatching them at intervals of 36 seconds—and it is not even suggested that this is possible—the present highest speed of eight miles an hour would automatically be lowered to seven miles an hour, and running fourteen trams a mile the system

would carry fewer passengers than the twelve trams now operated. Experience has definately proved that the equipment of the municipal railways can operate only twelve trams per mile, but this limitation applies only to the line between Shinagawa, along the Ginza, to Ueno and Asakusa Park, the main traveled line of the city. The whole city system will average only 7½ trams to a mile of single track.

On the 180 miles of track operated the greatest number of trams running at one time is theoretically 1,350. But in actual practice it is impossible to run more than 1,000 to 1,200 a day. Only a very few more trams could possibly be added to the number now run, maybe 150 to 240 could be added without absolutely disrupting the present imperfect system.

In 1909 the population of Tokyo was 1,620,000. In 1917 it had increased to 2,350,000. The average annual increase between these years was 91,000. During the same years the population of the suburbs and country districts in direct touch with the city's centre through the service of the municipal tramways, increased about 50,000 a year, making the total increase of population in and around Tokyo about 140,000 a year. In 1915, each person living in Tokyo rode on the trams 116 times. In 1918 the annual number of trips had increased to 145. The city's population is growing. while at the same time the number of rides each person takes is also increasing. It is easy to understand that the present transportation equipment of Tokyo city is absolutely out of keeping with the city's needs.

Motor Bus Lines

In the greater Tokyo which is growing up all around the old Tokugawa Yedo, a system of rapid transportation running from one end of the city to the other is gradually becoming more and more necessary to the progress of the city. To supplement the existing surface lines, and to relieve the congestion on the main lines of traffic, several motor bus lines have been opened in recent years by private interests. But despite the great need of the service they offered, the company operating the existing bus lines has been far from successful. Tokyo roads are uniformly bad, and their miserable paving makes riding on them more of an act to be endured than a pleasure, while as a vehicle of transportation the usefulness of the auto-bus is limited by the restrictions on their size and height. Expenses of operation are almost prohibitive, and it is generally believed that no great extension of their use can be expected in Tokyo until the paving of the roads is radically bettered, and the low-hanging electric wiring of the city is planted underground where it belongs. The Tokyo Shigai Jidosha Kabushiki Kaisha (Tokyo City and Suburban Automobile Co., Ltd.), despite its monopoly of passenger bus transport on the Tokyo streets is in rather a bad way financially, its last two dividends were passed, and its equipment is going from bad to very much worse without any attempt being made to keep it in adequate repair.

Any extension of motor bus lines is almost unthinkable, so it becomes more and more apparent that the solution of Tokyo's traffic problems is to be found in an elevated or an underground railway. Tokyo absolutely needs some rapid transit system installed at once. The elevated and the underground systems seem to be the only ones remaining which can be given serious consideration.

Nihonbashi Bridge, The Centre of Tokyo, looking South

At the Entrance of Uyeno Park, looking down Uyeno Broadway

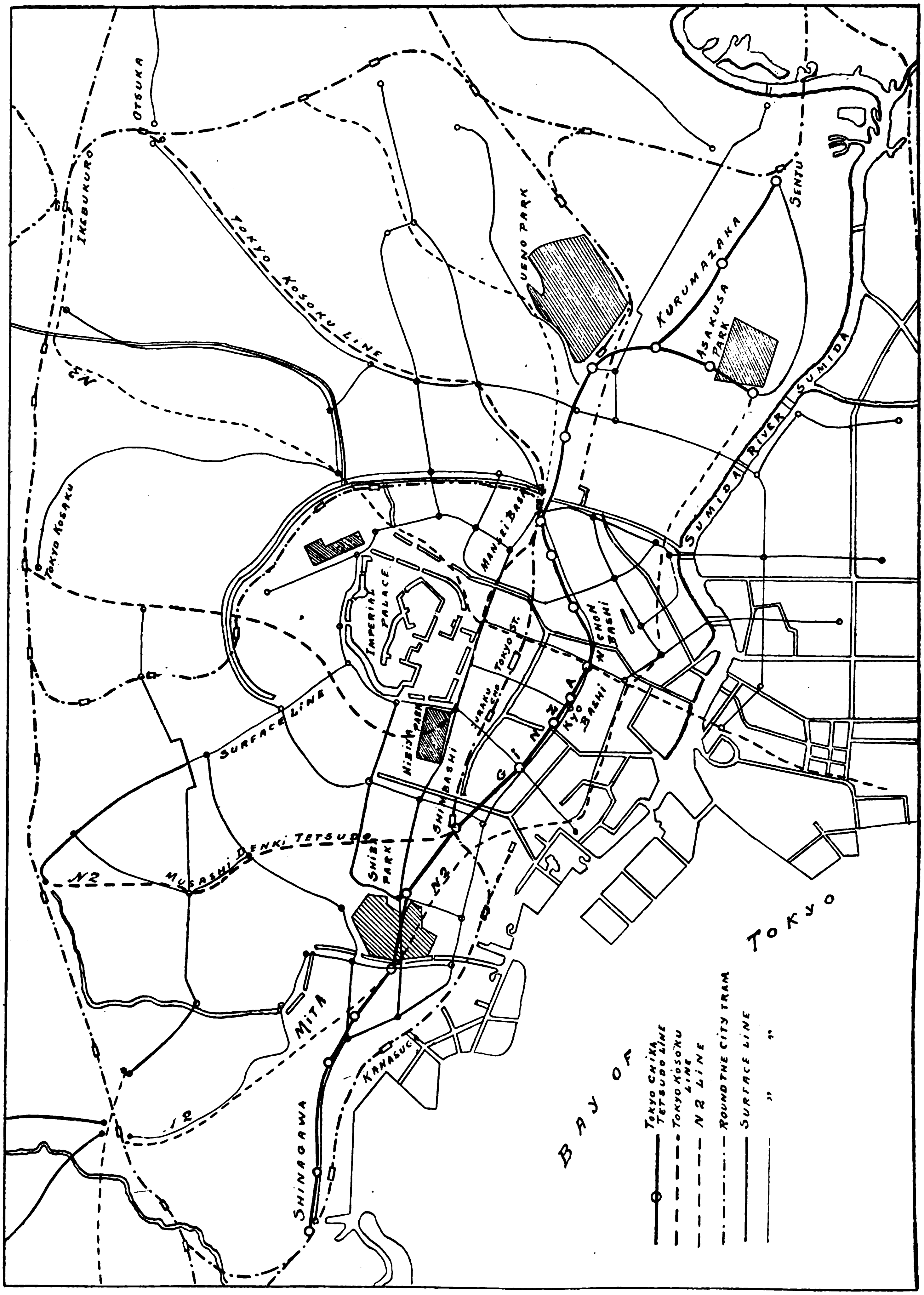
Without increasing the number of transportation systems, or introducing rapid transit lines, there are theoretically five ways of making a change that will relieve the situation and benefit the city (1) by increasing the number of trams operated; (2) by building and operating longer trams; (3) by building and operating wider trams; (4) by building and operating trams with upper decks; (5) by using trailers.

But there are many difficulties in the way of laying a net work of tram lines all over Tokyo. The city streets are too narrow to accommodate tramway rails and the ordinary traffic on all Japanese streets as well. Longer trams than the new bogey type now in use cannot be handled on the narrow streets where the present lines are always turning corners very closely cut; and because the streets are narrow the gauge of the lines is narrow also, so wider trams cannot be adopted. It is not feasible to use "double-deckers" in the Tokyo streets, because of the low hanging wire equipment of the city's light and telephone services. Trailers too are impracticable because there are so many hindrances to their successful operation in the crowded streets, that their employment would be more of a detriment than an advantage to the present system. Viewed in this detailed manner it becomes apparent that it is essential that some other system than the present surface lines be put in operation if a solution of Tokyo's transportation problems is to be reached.

How About an Elevated Line?

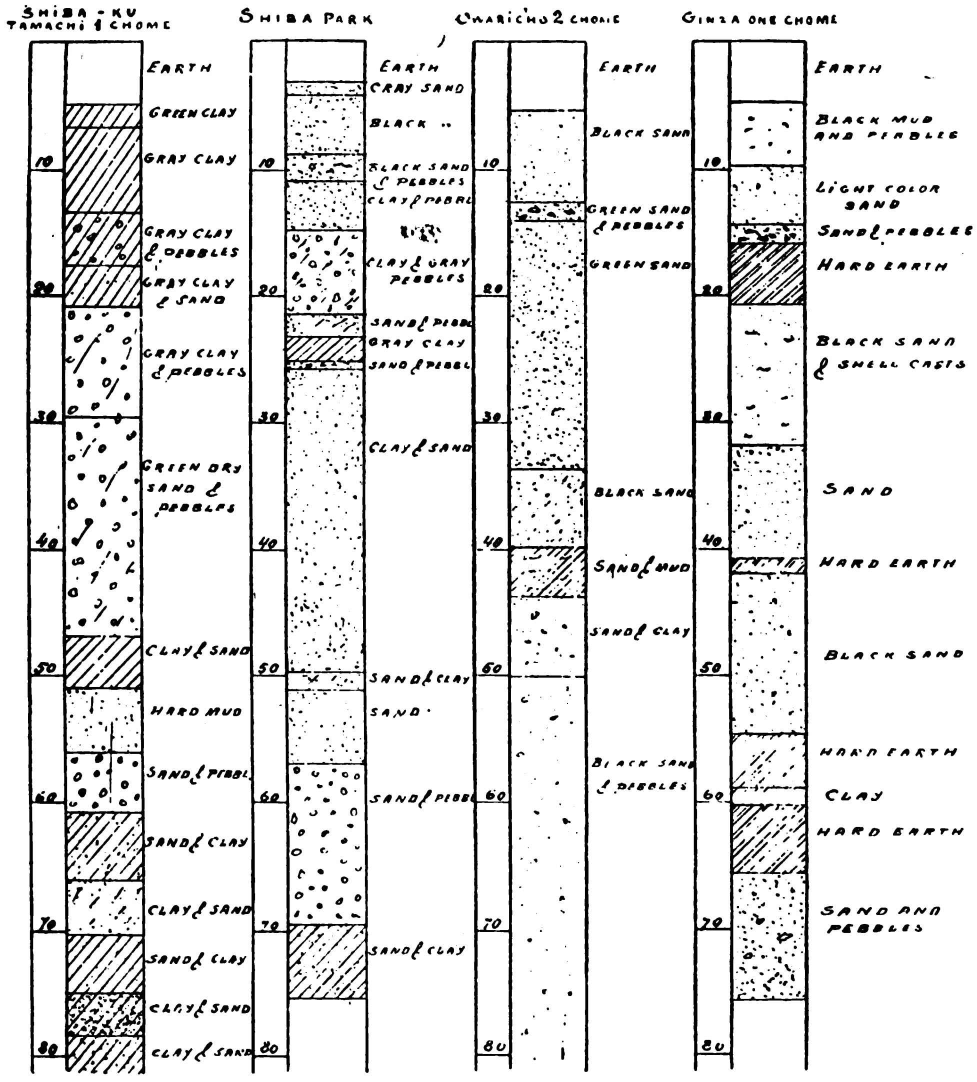
It is generally conceded that an elevated system would not be suitable to a Japanese city. Japanese houses are very low; in Tokyo the average building is but one story high and the roofs are not very far above the ground. An elevated system would necessarily be built high above the level of the city's roofs. Tokyo is a windy city, and at all times of the year, a dusty one. Even the present limited elevated system from Shimbashi station to Manseibashi station in the heart of the city, is a source of complaint because dust stirred up by the passing trains blows into the houses along the line. People object to the noise and shaking of the elevated. Furthermore, it would be almost impossible to build an elevated line through the awful tangle of wires which crisscross every Tokyo street in hopeless confusion. The final and most important obstacle of all is the expense of buying the right of way. To build an elevated adequate to satisfy the city's needs for local and express service would require such a wide road-bed that any private undertaking constructing an elevated railway system would be confronted first of all with the prohibitive expense of buying land on both sides

ROUTE OF PROPOSED TOKYO SUBWAY



of the line traversed. The cost of the right of way would make an elevated prohibitive, and even the Y.4,000,000 a mile estimate for an underground line fades into complete insignificance before the enormous sums an elevated line would expend before an inch of the line itself could be constructed. To-day, it has become the concensus of opinion amongst traffic men that the solution of Tokyo's transportation problem lines only in an underground line. The problem of the underground has been solved by the investigations of the Tokyo Chika Tetsudo Kabushiki Kaisha (Tokyo Underground Railway Co., Ltd).

The imperial railway department, it is true, operates a short elevated line from the entrance to the city on the south, near Shimbashi station to the Tokyo central station, and thence to Manseibashi, and out towards Yotsuya and Shinjuku, in all ten miles of elevated railway. But the only part of this ten miles which can properly be called an elevated rapid transit service is that between Shimbashi and Manseibashi, 2.4 miles. The seat of the railway department's elevated lines is really only an elevated roadbed for ordinary railway traffic which was not constructed with any idea of a high speed transport service in view. Consequently they have no connection at all with the main lines of city traffic, and are of no real assistance in helping out the jumble in the city's traffic situation.



Result of Borings for Tokyo's Subway System

Proposed Underground Railway Systems Licensed

In 1919 a great impetus was given to all kinds of company promotion by the tremendous increase in investment funds produced by war-time prosperity, and enterprising professional promoters were not slow to hit on the scheme of building underground railways in Tokyo. Almost at the same time, one license after another was granted by the Tokyo municipality and the imperial railway bureau.

The first license to build an underground railway line in Tokyo was granted to Mr. Toshimitsu Tsurumatsu, as promoter of the Tokyo Kosoku Tetsudo Kabushiki Kaisha (Tokyo Rapid Transit Railway Co., Ltd.), then the Tokyo Tetsudo Kabushiki Kaisha (Tokyo Railway Co., Ltd.), promoted by Mr. Iida Guchi, and the Musashi Denki Tetsudo Kabushiki Kaisha, promoted by Baron Senosuke Goh, president of the Tokyo stock exchange, were issued. Since the licenses were granted, however, nothing further has been heard of these three companies. The Tokyo Chika Tetsudo Kabushiki Kaisha (Tokyo Underground Railway Co., Ltd.), promoted by Mr. T. Hayakawa, was organized in August 1920, and at once began an active survey of the route for which the license had been granted. In February 1921 a survey of the soil along the line of the first line planned to be opened was begun, and completed in September 1921. Despite the handicap of the hard times which began almost immediately after the promoters first planned the company, and which have continued ever since, the directors of the organized stock company have continued uninterruptedly to pursue the original purpose of the promoter, which was and is, to build an underground railway in Tokyo which shall relieve the present congestion on all the city's surface lines. From the very inception of the idea the Tokyo Chika Tetsudo's promoters have been fighting against almost unsurmountable difficulties. First of all, no one in Japan knew anything about underground railways, their construction and operation, and no one seemed to care much about them either. For Mr. Hayakawa, who is neither an engineer nor an ordinary promoter, wished to build a tube, not merely promote an underground railway company. Mr. Hayakawa is a man of great ability whose mind is of the constructive type. He was struck with the growing transportation needs of Tokyo as far back as 1913, and went to Europe to study the problems of transportation in great cities. His studies only tended to confirm him in a belief that the solution of Tokyo's transit problem lay in an underground system, which would act as a long-distance carrier to relieve the long haul traffic on the city's overcrowded surface lines, and which would eventually be extended to tap important outlying districts of Tokyo, particularly the suburban railway stations. Mr. Hayakawa returned to Japan in 1919, at the height of the boom, to lay the results of his investigations before certain of his acquaintances who ultimately became animated with his enthusiasm for the project. The Tokyo Chika Tetsudo is the result.

The routes approved for exploitation by the companies licensed are given in detail in the following table, and reference to the map will show their relation to the important centres of Tokyo city.

1. Tokyo Kosoku Tetsudo Kabushiki Kaisha.
   (Tokyo Rapid Transit Railway Co., Ltd.)
   From Otsuka to Manseibashi, Hibiya, and thence to Shinjuku.
   Total: 8 miles, 60 chains.
   Cost of construction, estimated Y.37,000,000.
2. Musashi Denki Tetsudo Kabushiki Kaisha.
   (Musashi Electric Railway Co., Ltd.)
   From Shibuya to Hibiya.

Total : 5 miles.
Cost of construction, estimated Y.20,000,000.

3. Tokyo Chika Tetsudo Kabushiki Kaisha.
(Tokyo Underground Railway Co., Ltd.)

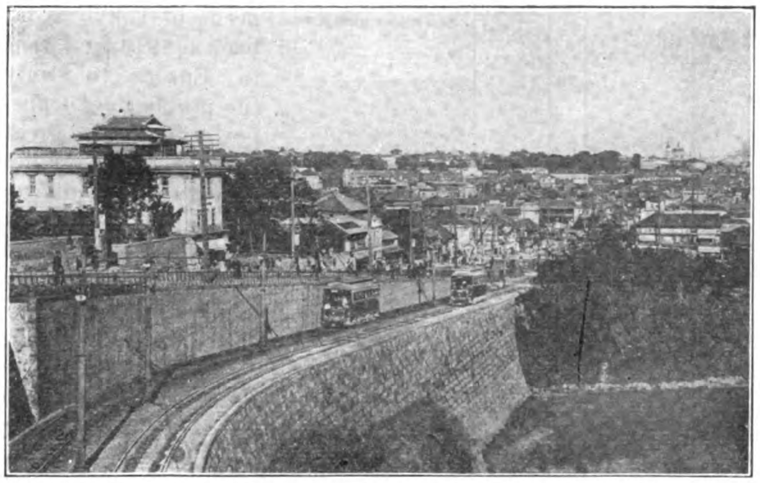
1st Line.

From Shinagawa to Shimbashi, Suda Cho, Uyeno, and Asakusa Park : thence to Minami Senju.
Total : 9.47 miles.
Cost of construction, estimated Y.40,000,000.

2nd Line.

Part 1. From Meguro to Tsukiji-Oshiage, the terminus of the Inter-urban Line, Tokyo-Chiba.
Part 2. From Ikebukuro to Takadanobaba-Iidamachi, Otemachi, and thence to Suzaki.
Part 3. Sugamo to Manseibashi.
Total : 20 miles, 60 chains.
Cost of construction, estimated Y.92,000,000.

The proposed line of the Tokyo Tetsudo Kabushiki Kaisha (Tokyo Railway Co., Ltd.), has not been published, and the company seems to have fallen out of sight since the slump in March, 1920.



The Business District of Kanda, Tokyo

It has already been said that there was no one in Japan with any knowledge of underground railway problems when Mr. Hayakawa put his ability at the disposal of his friends, and it might truthfully be said, his city. Shortly after the Tokyo Chika Tetsudo was organized privately in 1919, several engineers were engaged by the company to go abroad and study underground construction. No work was then going on in any European city except Madrid. And it is the Madrid underground which will be the model for the Tokyo tube.

The Tokyo Chika Tetsudo Kabushiki Kaisha

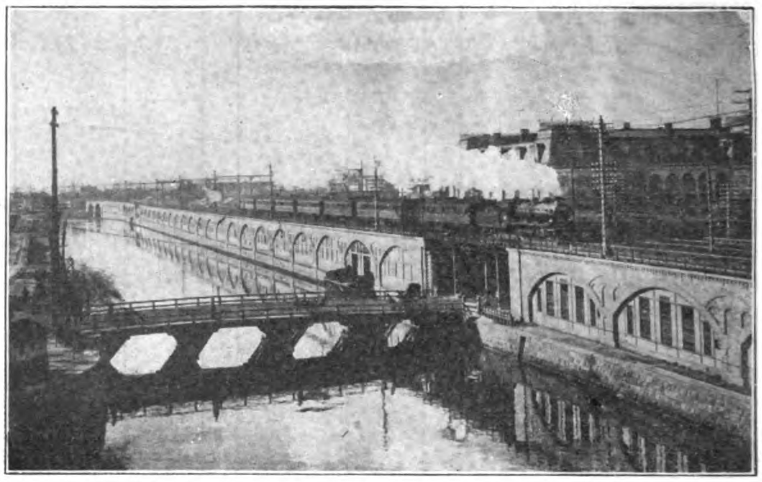
The slump which began in April 1920 effectually put a stop to any plans of soliciting public subscription for the shares of the Tokyo Chika Tetsudo. Mr. Hayakawa and his associates are all men of the highest standing and have the confidence of the whole financial world, but the panic stopped all talk of building an underground, while doubts which in the time of prosperity for company promoters were unexpressed, and which had little weight even of expression in those days, were openly entertained of the feasibility of building such a transportation system in the Tokyo " mud." It was feared that the tube would sink in the mud, or that it would be flooded by the waters of the rivers it must pass under, or earthquakes would destroy it, etc., all of which criticisms the company's promoters foundi t very difficult to answer until they had finished their preliminary survey of the soil along the route projected.

Tokyo Soil Conditions

No accurate data could be found anywhere on which to base an estimate of the engineering problems to be solved in building the proposed undergroundr ailway. The imperial railway department did have some specimen borings taken from the city's streams and canals which the present elevated system crosses, that showed a soil formation not at all complicated from an engineering standpoint. Upon these borings Mr. Hayakawa based the feasibility of his plan. Results of the detailed survey have proved the correctness of his suppositions.

When Tokyo people first heard of the underground railway plan they were much impressed with the novelty of the scheme, but when this wore off, they began to ask if the soil, the city was built on, would hold such a heavy tunnel. Wouldn't the city wake up some fine morning and find the tube sunk in the mud the city is popularly supposed to be built on ? Everyone knew that the surface trams and buses were always full, the success of such a scheme was a foregone conclusion, if it could only be made safe.

The Tokyo Chika Tetsudo declined further promotion, sales of stock, to raise funds, or advertising even, until the geological surveys should show exactly what the engineers were going to have



Elevated Railway, near the Tokyo Central Station

to face in constructing the tunnel, and its probable cost. In places the soil of Tokyo is certainly very soft, but the result of all the borings along the route of the first line planned is most satisfying and has revealed a condition much better than the geological experts of the imperial railway department and the imperial university expected. The opinion of several experts runs as follows :

" Along the line of the projected Tokyo Chika Tetsudo, the result of the examination has shown unexpectediy good conditions to exist. Specialists anticipated that it would be impossible to build such a tube, but the present survey has dissipated all their doubts. Several localities are nevertheless unsatisfactory, notably Shiba Park, the district between Satsumaparra and Kanasugi Bashi, and the district between Asakusa Park and Kikugawa Bashi. In these places the soil is weak, and it will be difficult to work in, but nevertheless it presents no insurmountable difficulties to underground railway engineers. Thus it is seen that the general opinion of the people that such an enterprise is an impossibility, is a mistaken one."

Fears that the tube might sink in the mud in soft places are unjustified by engineering experience. Pressure from below will support a tube just as the Hudson River tube is supported. The problem of construction is not a probable sinking of the tunnel, but one of accurate engineering construction which shall meet the difficulties of working in such places. The greatest difficulties the engineers will encounter will be in building the connecting links between the firm solid soil and the soft shifting mud seams which

will be encountered in Shiba, and under the rivers and canals which must be passed along the line between Shimbashi and Uyeno.

Geologists have found that the soil of Tokyo is composed as follows:

Surface to 10 feet below.—Sand with pebbles: or clay with pebbles.

10 to 20 feet below.—Clay, grey or blue or brown or yellow.

20 to 40 feet below.—Clay or sand with pebbles.

40 to 60 feet below.—Shell casts, with sand seams and pebbles.

Consequently the seam forty to fifty feet below the surface is the most desirable one in which to build the tunnel. Many persons fear inundation of the tube, but the permeation of water through clay seams will be so slight that it can be kept down to almost nothing at all by high power pumps. So this objection has also been answered.

The results of four borings made at another four places than those shown in Diagram 1, are given below:—

1. Kyobashi Ward, in front of Shimbashi Station.

Soil	Depth.
Grey sand	4.6718 feet
Green sand	3.6778 ,,
Sand mixed with pebbles	2.9820 ,,
Clay mixed with sand ...	7.7532 ,,
Green clay	6.2622 ,,
Green sand mixed with clay	1.1928 ,,
Green clay	4.4730 ,,
Green sand mixed with Clay	2.9820 ,,
	33.9948 feet

2. Nihonbashi Ward, Nihonbashi 1 chome.

Soil	Depth.
Mud	5.2682 feet
Shell casts with pebbles	1.7882 ,,
Green clay	2.3856 ,,
Yellow clay	1.4880 ,,
Sand and clay	5.0694 ,,
	15.9994 feet

3. Nihonbashi Ward, Nihonbashi 4 chome.

Soil	Depth.
Thin black mud ...	5.6658 feet
Green sand	4.5724 ,,
Coarse sand with some properties of clay ...	1.9880 ,,
Yellow clay	2.4770 ,,
Light green clay ...	9.1448 ,,
Sand mixed with clay...	8.9460 ,,
Brown clay	5.1680 ,,
Sand mixed with clay...	2.6758 ,,
	40.6378 feet

4. Kanda Ward, Imagawa Bashi.

Soil	Depth.
Black mud	1.7892 feet
Green clay	17.9911 ,,
Sand mixed with clay ...	11.6298 ,,
Brown clay	2.8826 ,,
Sand mixed with clay ...	3.1808 ,,
Green clay	5.8646 ,,
	43.3381 feet

(*Note.*—Borings taken in cold weather).

All question of the ability of these strata to bear heavy weights is solved as a consideration of the following table worked out by actual experiment of the Tokyo Chika Tetsudo engineers will show:—

Loading Capacity of Tokyo Soil, per square foot.

	At Surface	20 feet below surface.
River bottom mud	$\frac{1}{2}$ ton	$1\frac{1}{2}$ tons
Suburban district earth ..	1 ,,	3 ,,
Clay seams (wet)	4 ,,	6 ,,
Clay seams (dry)	6 ,,	8 ,,
Sand seams	3 ,,	6 ,,
Hard Sand Seams	4 ,,	8 ,,
Sand and pebbles mixed ..	8 ,,	12 ,,
Pebbles	5 ,,	10 ,,
Clay and pebbles mixed ..	10 ,,	10 ,,

(*Note.*—Ton of 2,240-lbs. sq. foot, is Japanese sq. *shaku*, equals 0.994 sq. ft.)

The borings carried out along the line of the first tunnel planned by the Tokyo Chika Tetsudo shows that from Shinagawa to Mita (see map), the soil is composed of mixed clay and sand seams which have a very high load capacity, and gushing springs are almost entirely absent along this part of the line. This makes it possible to dig the tunnel in a space only big enough for its own tube, or, as planned, from the surface like a ditch. Either method is applicable to the conditions discovered between Shinagawa and Mita.

From Mita to Shimbashi the soil is very complicated, but for the greater part of the proposed line it is composed of sand-pebbles, and sand-clay layers. These seams are strong. From Satsumaparra to Kanasugi, however, the soil is very weak, but even along this section it is possible to build an underground without much difficulty. If the line is dug a bit away from the bay shore into Mita Ward, it will be a very simple piece of work to get from Mita to Shimbashi through soil easy to build in.

From Shimbashi to Uyeno the soil is all good. For forty to fifty feet below the surface all the strata are sand seams. Below fifty feet there are strata of pebbles, and then of hard clay. In some places there are even some seams of very soft sandstone. Along this section of the proposed line there are four rivers which must be passed. Strange to say the soil in their vicinity is especially good, and at Shimbashi, Kyobashi, and Nihonbashi, along the river bottoms there are stiong compact strata of hard clay, and sandstone, excellent media for underground railway tunnel construction.

The most difficult places for underground construction are beneath river beds, but in Tokyo the soil in such places has proved exceptionally advantageous to such construction.

From Uyeno to Asakusa Park, the underground will follow the main surface lines, beneath the main street. The greater part of the way is composed of sand seams. The grain of the sand is even finer than that of the Ginz section (Shimbashi-Uyeno), and the load capacity of the soil is much greater. At Kikuya Bashi and in Asakusa, and in the vicinity of Umamichi there are some weak seams, but even these present no difficulties of construction. In these places it will be necessary to prepare the floor of the tunnel by driving piles to strengthen the tunnel foundation. Compared to Marunouchi, where the soil encountered is generally weak, Kikuya Bashi is no worse. Yet in Marunouchi they are building many fine office buildings of immense weight, and there seems to be no difficulty about their foundations. If it were necessary to drive piles along the whole line to strengthen the foundation of the tunnel the cost of construction would be prohibitive, but fortunately the first line is to be built along a route where it will be very easy to construct the tunnel.

When one speaks of the underground to-day people at once begin to talk about the prohibitive expense of such an undertaking. But in actual practice this will not be so very great. A thorough examination of the soil has shown that it is better than that of Paris or Brussels, in fact that it is very good indeed, and the construction of an underground line will be much easier than it was at first anticipated it would be.

Details of Construction

The license issued to the Tokyo Chika Tetsudo Kaisha permits the company to build the greater part of its first line just under the main streets. These streets are from 108 to 126 feet wide, including sidewalks, and as the underground tunnel will be only 24 to 27 feet wide outside, in no place will it be necessary to build the tunnel under the buildings on either side of the street, except perhaps at stations.

The soil excavated will be used for reclamation work along Tokyo Bay, and the sale of the soil will effect a great economy in the cost of construction.

The first line will have its terminals in connection with the government railway lines to Yokohama and around Tokyo city, and the Tokyo-Yokohama electric railway line at Shinagawa, and with the Oji electric tram line at Senju. The ten miles planned will actually serve in practice several tens of miles more than its own line in each direction out of Tokyo. It should, therefore, be as profitable a business in the future, as it is now a hopeful one.

The London tube is 52 feet wide, and 15 feet 9 inches wide. The Budapest tunnel is 19 feet 10 inches wide, and 9 feet high. In Madrid, the box-type tunnel is 19 feet wide, and 14 feet high, while the horseshoe type is 22 feet 9 inches wide, and 15 feet high. The Paris tube is a double track type, 23 feet wide, 14 feet 10 inches high. The underground in New York is the widest in the world, the double track line being from 27 to 29 feet wide, and the four track lines being 53 and 54 feet wide, and 13 to 15 feet high.

The Tokyo tunnel will be 17 to 18 feet high and 24 to 27 feet wide, built in the box-type, of reinforced concrete. The regulations of the imperial railway department governing the construction of underground railways prescribes a tunnel which shall be 22 feet wide, inside, and 12 feet high. The track will be broad gauge, and for this it was necessary to obtain special governmental permission. The Japanese tunnel will be smaller than the American, but larger than the British and German types. Between the tracks there will be steel supports for the roof of the tunnel. From the floor of the tunnel to the surface of the street, will be exactly 20 feet.

Cars will be 35 to 50 feet long, and built all of steel. The average speed will be about 35 miles an hour. Stops of 30 seconds will be made at the less important stations, while at important ones a whole minute will be allowed. This is the present operating system on the imperial government railways electric lines about Tokyo, not often strictly adhered to! Including time consumed in stopping at stations the average run will be 20 miles an hour. Trains will be equipped to rush into high speed on starting, thus saving time, and accordingly the run from Shinagawa to Asakusa Park, 8 miles, will be made in 25 minutes. On the present surface trams one is lucky to make it in less than an hour and a half.

The maximum gradient will be 1 in 30. The shortest radius of curves will be 300 feet, but most of them will be from 500 to 1,000 feet. Abroad trains turn in a shorter length, and the gradient is much steeper. The type of construction planned for Tokyo will make operation very simple and inexpensive. Stations will be underground so that there will be no big expenses for purchasing land to build on.

If all the soil of Tokyo were like that from Shinagawa to Mita it would be a very simple matter to construct an underground line in Tokyo. But along the Ginza where the strength of the soil is quite sufficient to hold the tunnel, there are many springs whose waters will seep into the tunnel. Just what the degree of seepage will be it is not possible to determine, but because the tunnel is built on a level it will be necessary to equip it with high power drainage pumps, which should keep the tunnel dry. Only through the pebble seams is any particular difficulty with seepage expected, but following the experience of the builders of the Berlin tube, the Tokyo engineers will use high power pumps and thus expect to ensure a safe dry tunnel.

The roof of the tunnel will be from three to six feet below the surface of the street. It is intended to build the tunnel just as though a deep trench were being dug, and the top soil will be replaced when the concrete tunnel is completed. Under the rivers tunneling will be carried on in ordinary operations, the river bottom first having been filled with cement, making the river bed above the tunnel a mere concrete ditch. This will avoid caisson work so that in no part of the line will iron tube construction be used. The route planned for the second line will take it under the Sumida River, where it will, of course, be necessary to carry on tunnelling in caissons.

Three or four years ago some sewers were dug in certain parts of Tokyo, especially in Shitaya Ward, at Ryusenji and Mikawajima. The trench was dug from 20 to 25 feet below the surface, 15 feet wide, and the height of the sewer conduit was 8 feet. The conduit was made of reinforced concrete. Certainly if this sewer could be built in poor soil, the Tokyo Chika Tetsudo tunnel which will be a double line tunnel, with an outside width of 25 feet, and height of 17 to 19 feet, can easily be built even in bad soil. Stations, of course, will require larger spaces, but they need be only 12 to 13 feet high.

There are many lines of water mains and gas pipes laid beneath the surface of Tokyo streets. Generally they are only 2 to 3 feet below the surface, although in some places they lie as low as 5 to 6 feet underground. Compared to the depths at which such pipes are laid in many foreign countries, this is not exactly deep.

In two places on the Ginza which the main line will follow there are 7 such pipe lines now laid. Water mains 20 and 30 inches in diameter, gas mains 6 inches and more in diameter, and some sewer pipes 12 and 14 inches in diameter, and a few instruments of the Tokyo municipal railways and the Tokyo Dento Co. (Tokyo Electric Light Co.), are also buried under ground. From the Ginza to Uyeno the main street is 90 feet wide, exclusive of sidewalks. The outside width of the underground tunnel will be 27 feet, so that it can easily be built under less than half the width of the street above. So owners of buildings on the surface above the underground line need entertain no anxieties about the foundations of their property. Only at the stations will the line be crowded out under the space occupied by the surface tram lines. Tokyo is not overly well equipped with pavements and light and power wire carrying poles, so the company will be put to little expense for tearing up and replacing expensive improvements. When the underground is completed all the gas, and water mains, and sewer lines will be buried again in a conduit which will hold them all.

Cost of the Underground

If there are no unexpected engineering difficulties encountered in constructing the Tokyo underground, and if the soil is no different from that revealed by the tests already made, estimates of the outside cost of the first line between Shinagawa and Asakusa to Senju are Y.4,000,000 a mile. Four million yen a mile will cover the cost of the tunnel, all railway equipment, passenger stations, power transmission stations, automatic safety devices, in fact everything of the very latest efficiency to ensure the successful operation of such a railroad. The Tokyo municipal bureau of construction and the municipal railway bureau are agreed that Y.4,000,000 a mile will cover all the necessary expenses of construction and equipment. If Y.4,000,000 is the maximum cost per mile, then the nine miles and forty chains which are planned between Shinagawa and Asakusa will require Y.38,000,000. The Tokyo Chika K.K. directors estimate that the actual cost of putting the line in operation will actually be about Y.3,000,000 less than this. But any difference in estimates makes no particular difference to-day, the whole question now is, Will the road prove profitable ?

It will require at least Y.4,000,000 capital paid up in full to put the underground in operation. Assuming interest or dividends at 8 per cent. a year, the company must earn Y.3,200,000 net profit annually in order to interest capital in its shares. Certain sums must also be set aside annually for depreciation and maintenance of equipment, and there are also the usual reserves, bonuses and the dividend equalization fund, so important for all Japanese industrial enterprises. Including all these funds the company must earn at least 12 or 13 per cent. a year net, about Y.5,200,000.

There will naturally be two sources of revenue, passenger and freight traffic. But although freight traffic should be extensive, it is not calculated on to yield one sen of revenue in the estimates which the promoters have made of probable earnings. The Tokyo municipal railway's lines from Shinagawa to Uyeno and to Asakusa, and then on to Kurumazaka, and Senju-Ohashi (see map), are to be followed, more or less, by the Chika Tetsudo tube, and the income for these lines on the surface is publicly known, so that it will serve for making an estimate of the probable passenger traffic and income of the underground.

Assuming that the income of the underground will reach a third of that of the surface lines, that third would be at least Y.6,673,000 a year.

On September 1, 1916, there were 42 stations on the municipal surface lines between Shinagawa and Asakusa, and that day 334,300 passengers were carried between the two terminals, while all the lines in the city carried 908,848 passengers the same day. From these figures it can be seen that 36.8 per cent. of all the passengers carried in that city that day rode between Shinagawa and Asakusa.

Between September 1, 1920, and August 31, 1921, the whole number of passengers riding on the municipal surface lines was 424,050,844. If we assume the percentage shown in 1916 for the traffic on the Shinagawa-Asakusa line still to be good, in the 1920-1921 fiscal year between the terminals alone, 156,050,710 passengers were carried. The increase in passenger traffic is about 10 per cent. a year, and on the basis of the figures given it becomes possible to estimate that in 1921-1922 fiscal year, 171,655,781 persons, in 1922-23 fiscal year, 188,821,395 persons, and in 1923-1923 fiscal year, 207,703,495 persons will travel on this important main line through Tokyo's busy streets.

If in 1923-24 one-third of these passengers should ride in the underground 69,234,498 fares will be paid. The tube will be opened in 1924, so we need not consider passenger conditions before that year in any estimate of the income of the Tokyo Chika Tetsudo. Consequently it is not a far stretch of the possibilities to estimate that the Shinagawa-Asakusa underground railway line will carry at least 69,200 passengers in the first year of operations.

Fares paid have been estimated at an average of 9.6 sen per person. The basis of the estimate is the ideal of charging the same fare for a long or a short ride. If a special charge is made for long rides, then perhaps 8 sen will be charged for the short ride. But this will make little difference in the estimates of total income. There is some talk of dividing the line into zones, but this would be a great mistake. The real utility of the underground line will be for long rides, not for short ones, and if it is efficiently operated it should absorb all the long-distance traffic now crowding the surface lines. Therefore the distance between stations will not be too short.

The lowest fare charged will probably be ten sen for a ride of half the distance. Full fare for the whole line will be 20 sen. If the line is divided into fare zones, it will probably not increase income. If a different charge is made for the long and the short hauls, it is very difficult to estimate income. But if income is estimated at a uniform fare of ten sen for all rides, then total income for the first year will be Y.6,920,000. This is Y.240,000 more than the company's estimate, and actually the result will probably be even better than this estimate. The line from Kurumazaka to Senju is not included in this estimate.

The Tokyo Chika Tetsudo Co. estimates annual cost of operation and upkeep at Y.1,536,000. Of this amount Y.273,750 represents power cost, based on a consumption of 25,000 kilowatts a day, at 3 sen a kilowatt. Other traffic expenses are estimated at Y.297,660: Office expenses, etc., at Y.149,000. Other operating costs :—

Carriage upkeep	Y.61,000
Track upkeep	20,000
Wire upkeep	8,500
Building repairs	15,000
Taxes	55,000
Operation of transformer stations	11,500
Miscellaneous expenses	15,000

The cost of power will, of course, vary with the number of trains operated, and the number of passengers carried. All other expenses, if compared to those of other companies, show that they have been adequately provided for.

The estimates for carriage and track upkeep at Y.90,000 may seem insufficient, but if the total expenditure is raised from Y.1,530,000 to Y.1,560,000 a year a discrepancy if any can easily be met. If income is Y.6,940,000, and expenses Y.1,560,000, net profits will be Y.5,400,000. It has been estimated that from Y.4,800,000 to Y.5,200,000 will be needed to pay a dividend of 8 to 9 per cent., but it can be seen the figures given here provide for Y.200,000 to Y.6,000 in excess of the needs of the company. If expenses are increased Y.100,000 a year over the company's estimates this will still leave a net income of Y.5,320,000. If this turns out to be the case the ratio of profit to paid-up capital will be 13.3 per cent., and an eight per cent. dividend will be easy to pay. All estimates have been prepared so that in actual practice there can be some contraction if necessary, and this makes the promoter's estimates more worthy of confidence.

It is conceded that an estimate that passengers will be only one-third of the number now carried on the surface line is too low. Experience abroad with undergrounds has been that the underground carries from 2½ to 14 times the number of passengers riding on the surface lines. Assuming the number of passengers in the Tokyo underground in 1926 to be one-half as great as the number using the surface line, the result would be (leaving out of all calculations the Kurumazaka-Senju line), 103,851,500 passengers. Paying 10 sen fares the total income of the company would be Y.10,385,000. If profits are figured to increase Y.2,000,000 in the same year, and paid-up capital is Y.40,000,000, then net profits would be about 20 per cent. If passengers reach the numbers estimated the cost of Y.4,000,000 a mile will be very little compared to the results that will be financially achieved.

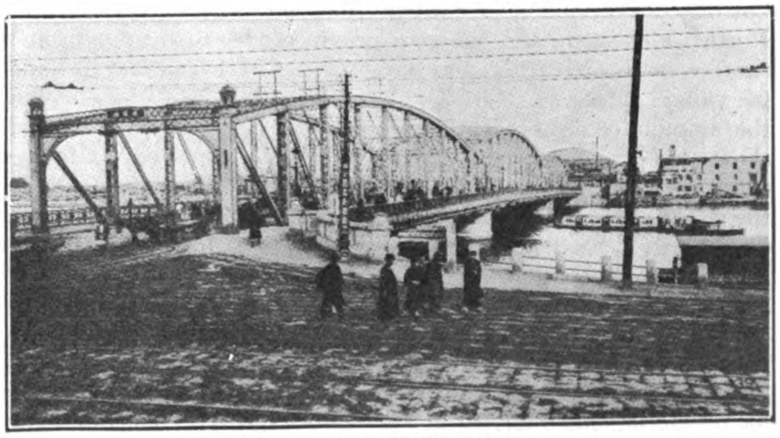
The average city tram fare is 6.88 sen. If the underground carries only 103,000,000 passengers at this fare, its earnings would be Y.7,155,000, and net profits Y.5,150,000, a profit rate of 12.8 per cent. All the shareholders expect is an 8 per cent. dividend, and there will be no difficulty whatever in earning enough and more than enough to pay it.

The Tokyo Chika Tetsudo Kabushiki Kaisha was organized at the time of the business boom with an authorized capital of Y.40,000,000. The panic caused the promoters to decrease this to Y.10,000,000, but only Y.1,000,000 was ever paid up. With this money the preliminary surveys were undertaken, and now that they have proved so successful the balance will soon be called up.

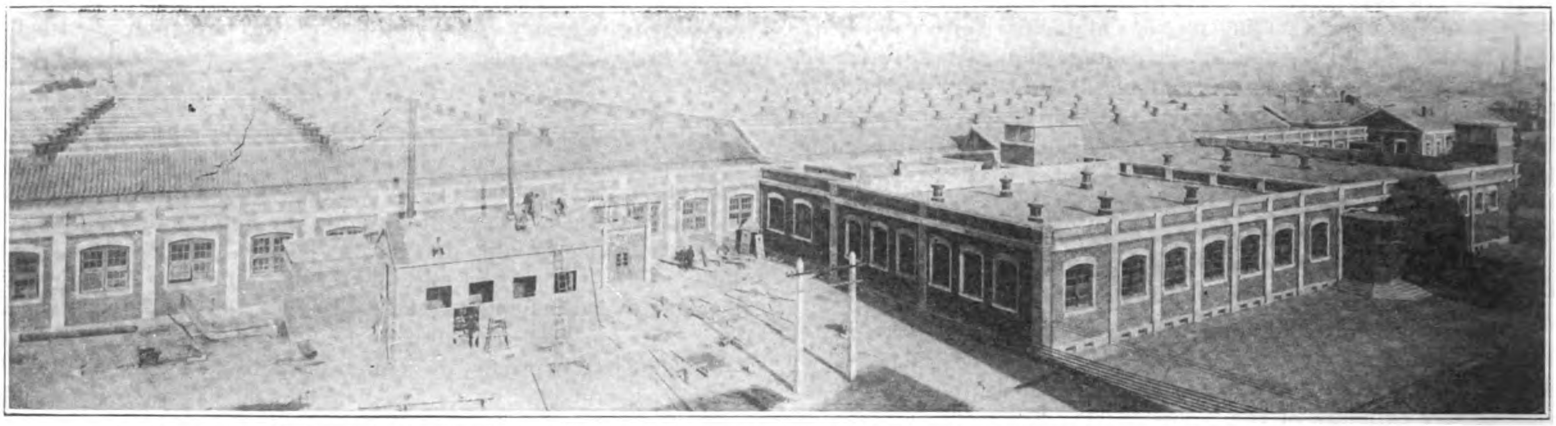
It should not be difficult to raise the balance of the Y.30,000,000 needed. But if this proves impossible in Japan, foreign investors will be asked to co-operate with the Japanese promoters. It is conceded that Japanese investment conservatism is doing a great deal to retard the building of the underground, financiers having no experience in such enterprises to guide them, and consequently they doubt all the estimates, and the feasibility of the project.

It is said that American financiers are looking over the field, and that they are much impressed with the findings of the Tokyo Chika surveys. Furthermore it has recently been reported from London that British financiers will co-operate with the group which has been licensed under the name of the Musashi Denki Tetsudo under the leadership of Baron Goh. But as this concern has not made one step to investigate the soil along its proposed route, the Tokyo Chika Tetsudo is the first in the field.

The complete geological survey was completed in September 1921, and ever since the plans for construction have been in preparation. It is now reported that actual construction will be begin in February or March of this year. The other companies have not yet got beyond the stage of plans to do something later.



Ryogokubashi Bridge, Tokyo



A Modern Textile Plant in North China; The New Heng Yuen Textile Company's Mill at Tientsin, equipped throughout with American Machinery

North China Cotton Industry

THE rapid development of the Chinese cotton industry during the last two decades has caused surprise in China and other countries. During or before the so-called "Boxer Rebellion," in 1900, the cotton spinning industry was not understood by the people in North China, and cotton growing was known only to a very limited number, says Mr. Ben Y. Lee, of Tientsin, in the *Textile Mercury*. But to-day millions of pounds of cotton are being produced annually and millions of *mows* of land are under cotton cultivation. Tientsin is the great cotton mill and cotton distributing centre in the north of China, and ranks second in China, next to Shanghai, as a great cotton manufacturing centre and is a new field for this industry. If conditions remain favorable as at the present time, in a few years to come this city will have a half million spindles and thousands of looms. The business opportunities of the city are based on the fact that it is the outlet for a vast hinterland consisting of the richest provinces of North China, and extending into Mongolia. Its good communications by land, rail and water have made it a distributing centre for a constantly growing volume of imports and exports. It is the great distributing point in the north of foreign goods as well as a collecting depôt for goods to be shipped abroad. Animal products and cotton form its chief exports.

Almost all cotton grown in the north provinces is being shipped to Tientsin. Some is being exported to Japan, where it is used for stuffing kimonos and other garments, and also to the United States, where it is mixed with wool in the manufacturing of blankets. Owing to the fact that it is well adapted to the latter purpose, the United States is one of the best purchasers of this grade of cotton. Cotton cultivation, on the whole, has not been so successful in North China as in the Yangtze provinces, because the season is shorter, frosts are earlier, and the soil is not so rich as that in Yangtze valley. Prior to 1900, there are no available statistics to show the amount of cotton in this region. In 1902, however, records show that there was more than 70,000-lb. exported to foreign countries, especially to Japan, and to other ports in China. During the last twenty years cotton exported from Tientsin has been grown enormously. Since 1910, the annual export from Tientsin has varied from 50 to 100 million lbs. Factors which have stimulated cotton production are the substitution of the cotton plant for the opium cultivation which had been prohibited by the government; the organizing of the Chinese millowners' association; the bureau for the improvement of the cotton industries; and organizations for promoting the industry in various places by establishing many cotton experimental stations; a better demand from abroad, especially from Japan; the successful efforts of the dealers to stop the practice of watering the cotton; and lastly the high price of cotton during the past few years.

The following table gives the amount of cotton grown and the amount of land used for cultivation of cotton in the northern provinces and also others. In the northern provinces are included Chihli, Shantung, Shansi, Shensi and Honan. The word "*mow*" in Chinese means about one-sixth of an acre, and *picul* about 133-lb. :—

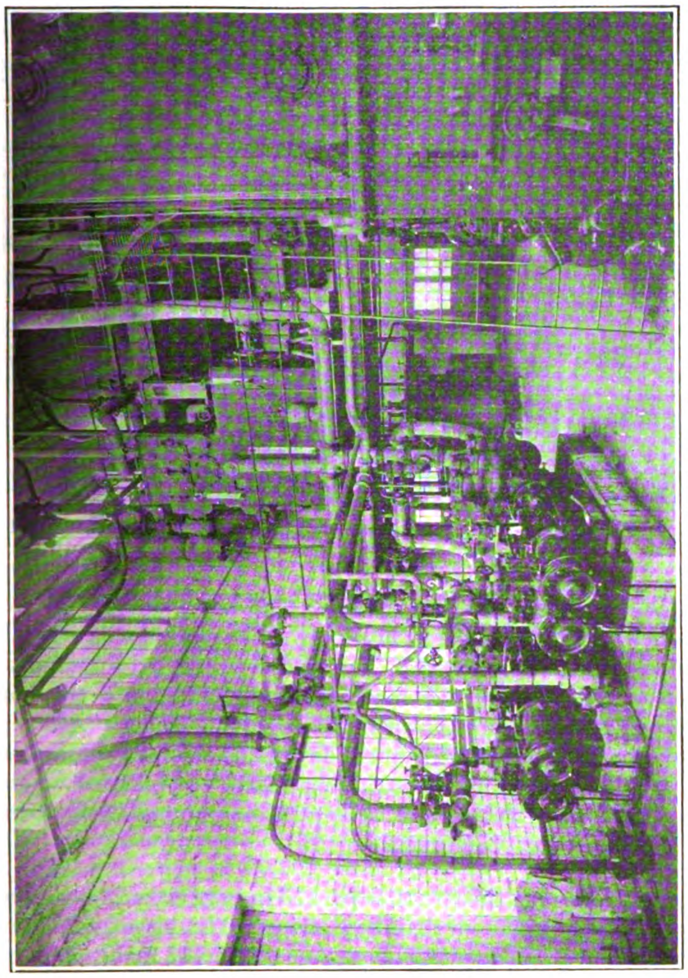
	1918. Piculs.	1919. Piculs.	1919. Mows.
Chili	2,099,381	4,794,083	6,104,349
Shantung	720,787	3,429,610	3,873,500
Shansi	304,322	99,370	490,000
Shensi	680,000	720,000	—
Honan	268,161	2,746,620	2,531,600
Hupeh	2,370,000	4,300,000	3,971,342
Kiangsu..	3,368,500	4,128,500	8,890,000
Chekiang	724,000	743,000	1,638,000
Hunan	—	78,150	73,420
Kiangsi	131,250	16,900	16,400
Szechuan	—	—	—
Anhwei	243,000	125,530	—
Total	10,022,700	19,577,000	27,500,000

The foregoing table has been compiled and tabulated recently by the bureau for the improvement of the cotton industries, Tientsin. The statistics given by the Chinese millowners' association, Shanghai, in regard to the production in 1919, is 4 million bales of 500-lb. each. The difference is due chiefly to the incorrect reports and incomplete investigations of both associations and also the inaccessibility of certain parts of the country. Cotton grown in many localities is being consumed locally, hence absolute accuracy is almost impossible. It will readily be seen that Chili province, in which Tientsin is located, is becoming a great cotton-producing centre. The following table gives the percentage of cotton grown in various provinces, and the numbers are for the reference to the chart :—

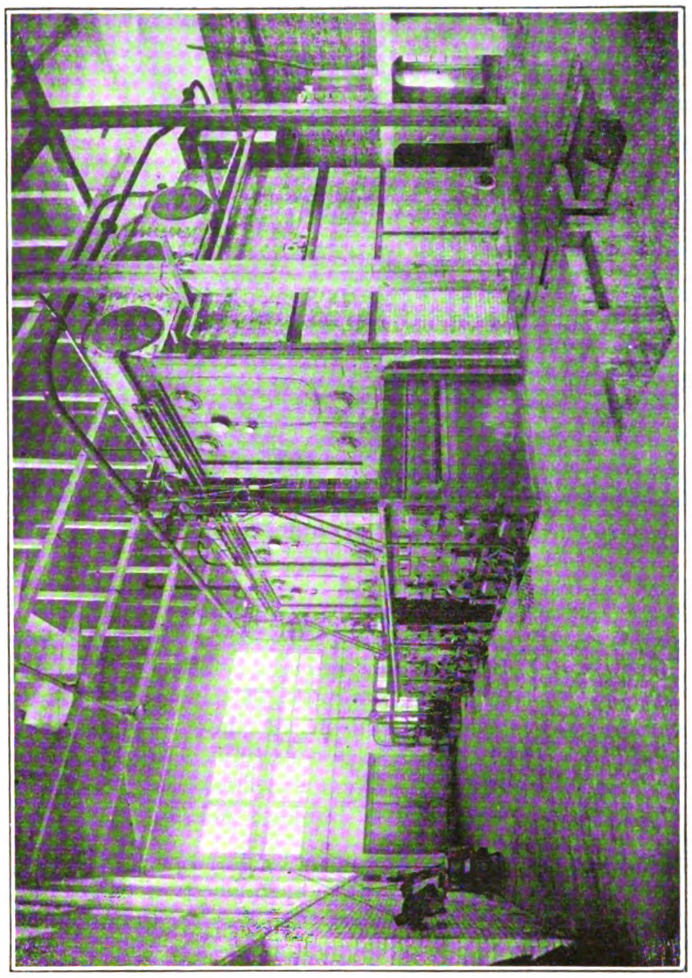
	1918.	1919.		1918.	1919.
Kiangsu ..	35.70	21.00	Honan ..	2.63	14
Hupeh ..	20.41	21.60	Anhwei ..	2.10	0.6
Chili ..	18.15	23.00	Kiangsi ..	0.91	0.10
Shantung ..	6.23	17.00	Shensi ..	5.19	0.37
Shansi ..	2.32	0.5	Chekiang ..	6.26	3.80

The average length of fibres grown in the North is about 1-6th to 1-8th of an inch, and some are of nearly an inch. It can be spun

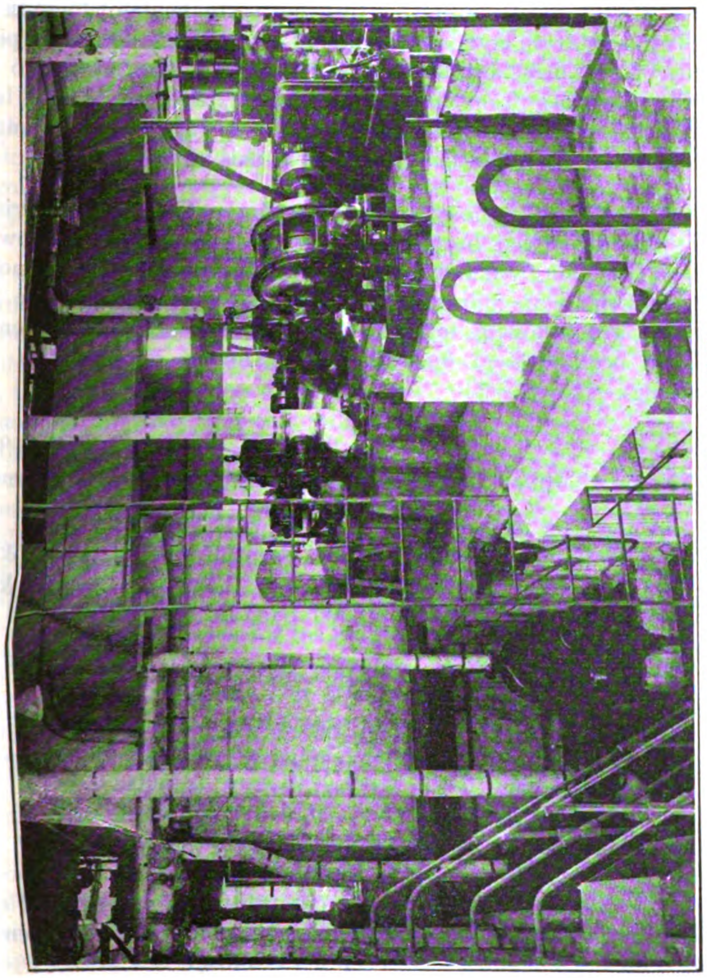
POWER EQUIPMENT IN THE HENG YUEN TEXTILE MILL AT TIENTSIN



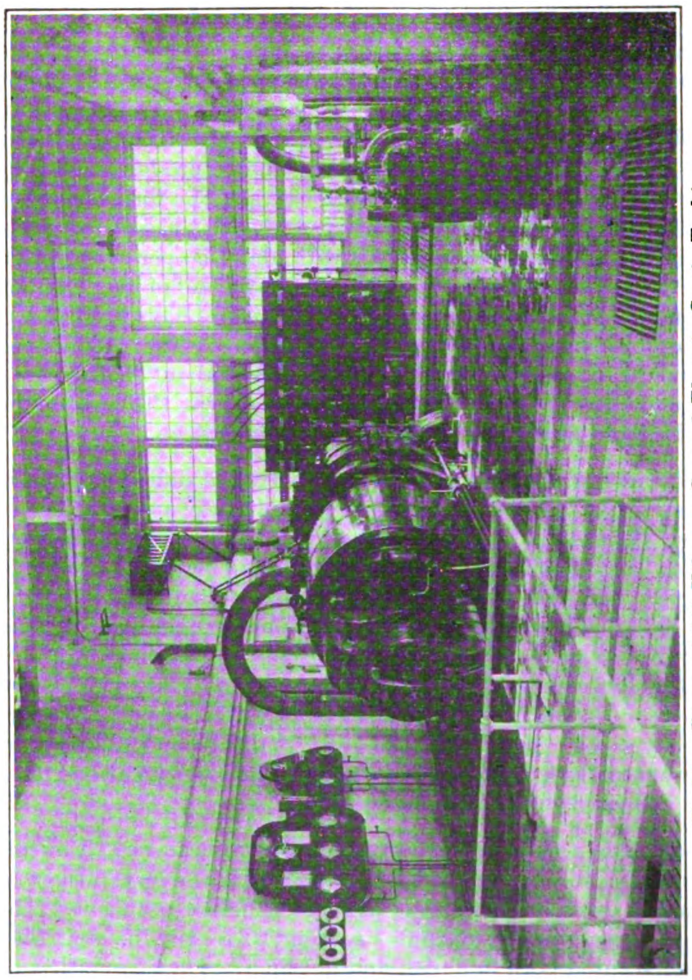
Boiler Room—Auxiliary Equipment



Boiler Room—To be enlarged to 5 B. & W. Stirling High Pressure Boilers with Murphy Stokers and Diamond Soot Blowers



Circulating Water and Hot Well Pumps



Turbine Room: 1-750 Kilowatt General Electric Curtis Turbine

Section Card Room, Saco Lowell Textile Machinery, American Moistening Co.'s Humidifier System

Spinning Room: General Electric Motors used throughout Mill

up to 36's. The staple most nearly resembles Peruvian cotton and is of fairly good color, but is wiry. The above is from native seeds. Many tons of American seed are now being distributed free to the farmers living in the neighborhood of the various government experimental stations. Almost all these stations have finally decided upon "Trice" as the best early variety of American cotton for extensive cultivation. Next to "Trice" is "Lone Star," then "Cook's Big Boll" and finally "Banker's Account."

Modern farm implements are not yet employed, because of the lack of modern improvements and the narrowness of the Chinese cotton field. The average field is less than half an acre in width. Man labor is employed chiefly on account of the low rate of wages. Little or no science is applied in the cultivation. The rotation adopted is somewhat irregular.

Planting begins in the early part of May. Seeds are scattered all over the field instead of being distributed in rows. Thinning usually takes place about a month after seeding. Picking begins in October until before the frosts. Two kinds of fertilisers are used. The one which is used extensively is the "home product," and the other is the cotton seed cake and bean cakes. The former may be applied to the soil either before or after, or during the cotton season. It consists of human excreta diluted with about 50 per cent. water. It is distributed over the fields by hand with the aid of long handled ladle, and is spread over the surface of the soil. This kind of fertiliser may be purchased at very cheap prices. The cotton seed cake and bean cake are broken into pieces about half-an-inch square and then are put into the cotton bed near the root of the cotton by hand at about one-quarter of an inch deep.

The exact cost a *mow* of producing cotton is difficult to ascertain, for nearly all the cotton growers cultivate a few *mows* of land by themselves without hiring any help. Some farmers managing large farms generally hire help, and pay from 30 to 70 dollars per year, with food and shelter free; while others pay from 4 to 10 dollars for picking for one season only. Each *mow* of land can produce from 60 to 150-lb. of seed cotton, of which 30 to 35 per cent. is lint cotton. The price of lint cotton in this region since the new year is from 21 to 23 taels per picul. Nearly all the growers do not buy seeds; they select the good quality from year to year. On account of lack of intelligence and technical education, most farmers cannot manage farming on a large scale.

The cotton gins employed are similar in appearance, principle and operation to the "Macarthy" gins. Nearly every farmer of some means owns one, and gins his cotton before selling it. The weight of these ginning machines is from 70 to 100-lb., and they are manufactured both in Japan and in China. They can either be moved by steam or man power. The total amount of cotton produced by one of these machines in a working day of eleven hours is from 150 to 200-lb. The seed cotton is fed by hand to the table in the front of the machine, and, falling into the hopper, is brought into contact with the revolving roller. After being passed through many mechanical devices, the ginned cotton is stripped from the roller by the stripping beard. It falls to the ground in a continuous fleece, and is kept from mixing with the seeds by a sheet iron division plate.

After ginning, the cotton is packed in bags either made of coarse grey cloth or made of bamboo strips. The sizes of these bars vary, some being 84 to 46 inches, some 72 by 42 inches, and others 48 by 36 inches. The weights of these bags are various, from 300 to 100-lb. Cotton is either transported by boats or by railway; the transportation cost varies from 60 cents to one dollar per picul. Many foreign firms and their representatives to the interior to buy small quantities from individual farmers, and then ship large quantities at a time by special boats. A Japanese firm named Mitsui & Co. is doing a large business of this kind.

The increase in the number of spinning mills in these provinces has been developed in proportion with that of cotton growing. Before 1914 there was not a single cotton spinning mill in the north, but now there are more than a dozen scattered over these provinces. The following table gives the number of mills in Tientsin and its neighborhood including those under construction and planning :—

Name of Mill	Year est.	No. of spindles	Maker	No. of looms
Heng Yuen (old unit)	1914	5,000	H. & B. English	
Heng Yuen (new unit)	1920	20,000	Saco Lowell	300 (C. & K.)
Yu Yuen	1918/21	70,000	Saco Lowell	500 (C. & K.)
Wash Sing No. 1 ..	1918	20,000	Saco Lowell	
Yu Ta (under construction) ..		35,000	Saco Lowell	
Pao Cheng No. 3 (under construction)		50,000	Saco Lowell	
Pei Yang No. 1 ..	1921	25,000	Saco Lowell	
Wei Yu (Proposed)..		20,000	Saco Lowell	
Model Mill (under construction) ..		10,000	Fales & Jenks	

It is reported that Japanese capitalists have proposed three mills of from 20,000 to 30,000 spindles each to be located at Tientsin, but so far none of them have been materialized.

The following table gives the number of mills in other northern provinces :—

Mukden Mill (under construction) ..		10,000	Saco Lowell	300 (C. & K.)
Lu Foong, Mukden Tsinan, Shantung	1918	15,000	H. &. B. English	
Wah Sing No. 2 Tsinan, Shantung	1920	15,000	Within	
Wah Sing No. 3 Tangshan, Chili		12,000	Hetherington	

There are also several proposed new mills ranging from 10,000 to 15,000 spindles, to be located in Shensi and Honan provinces. The makers of the machinery are both British and American. It is also reported that there are many Japanese mills to be operated in Tsingtao, Shantung.

Nearly every cotton mill in the North, under Chinese management, especially those in Tientsin, is or has been financed and promoted by high or ex-officials. In many Tientsin mills the big shareholders are not well known in public. Pei Yang, a mill in Tientsin, is the only exception to the general rule, that is financed entirely by the Chinese yarn dealers in the city. The wages and salaries paid in all the mills in the North are about 10 per cent. higher than those in Shanghai and elsewhere.

The Yu Yuan Textile Company of Tientsin is the most prosperous. The mill was organized and constructed in 1917, and was under operation in 1918 with 25,000 spindles. The promotors are high officials, and the mill has been financed by a few men. During the last three years enormous profit has been made, and with this the second extension of 25,000 spindles was made in 1920, and a third extension of 20,000 more spindles and 500 looms will be made in 1921. Thus with a total of 70,000 spindles and 500 looms, it becomes the largest mill under the same management in the North, and one of the largest Chinese mills in the empire. Among the factors that have contributed to its success are honesty and efficiency on the part of the manager, together with good systems of bookkeeping, recording of production, and laborers, etc. The mill employs practically all young men, called apprentices, from 12 years old and upwards, with a few women operatives. Lodging and food are provided free to the apprentices' and mechanics' families. The tenement rooms are built of one story near the mill for all operatives. The daily production per spindle for 16's yarn for so-called 24 hours is over 1-lb., and for 10's nearly 2-lb. On the average the percentage is from 5 to 10 higher than other Chinese mills. The breaking strength of 16's yarns is nearly 90, and of 10's is over 110-lb. These two things have made the mill successful in the manufacturing end. Roving, draw frame and spinning frame operatives are paid by hanks. In average Chinese mills there are about 650 employees per 10,000 spindles for both day and night shifts, but this mill employs 5 to 10 per cent. less. In other mills many small children, not tall enough to reach the front roll of spinning frames, are employed ; in this mill not a single person under 12 years of age are employed. Dining halls are provided for operatives outside the mill proper. Such things are rarely seen elsewhere in China.

The manager being instilled with modern education is doing much philanthropic work for his employees. The welfare features for the employees have been developed. Pool room, mill school, lecturing system, reading room, library, etc., are provided. Such a spirit is rarely found in Chinese mills. Nearly every operative has been receiving a bonus twice a year of from 10 to 150 dollars each. Every salaried man has been receiving more than 200 per cent. bonus monthly besides some "extra" during the past years. The manager himself has been receiving, including salary and bonus, more than the president of the United States receives annually. The shareholders have been receiving over 30 per cent. dividends besides the additional shares for the new additions. Perhaps within a few years the mill will become the largest one in China.

The question of supply and demand of cotton for local consumption in the north is important as well as interesting. Taken as a whole, China has up to the present time about 2,000,000 spindles, more than 1,500,000 of which are located in Shanghai or in its neighborhood. In the northern provinces there are about 300,000 spindles, including those under construction and proposed, or, in other words, there are about 15 per cent. of the total spindles located in the north. Yet the northern provinces produced last year a little over 50 per cent. of the cotton grown in China, and it is expected a greater percentage will be produced in consecutive years. One great and distinct advantage that the northern mills have is the abundant and ample supply of raw cotton. At the present time the larger part of the cotton grown in the north is being exported to Shanghai or to foreign countries. On the average each spindle consumes about two and a half piculs per annum, then 300,000 spindles would consume at the most 750,000 piculs per annum. It is clearly seen that the question of shortage of supply of cotton for the northern mills does not enter into any serious consideration. The high price of cotton yarn and raw cotton during the year 1920 up to the present time, which materially aided in the rapid development of the cotton mill industry in China, rhould also be taken into consideration. The prices of these had seached their highest points in the early part of 1920, and has been generally falling since. The price of cotton from its highest to its lowest is about 10 taels or about 14 dollars per picul. It takes about 3½ piculs to make a bale of yarn, thus making about 35 taels difference in the cost of raw cotton at the two different periods. Adding the difference in the cost of raw cotton to the low price of yarn, it is evident that the actual profit made per bale by cotton mills differs but slightly from that of 1920. The following figures show the price of yarn and raw cotton in each month during the mentioned months. The Tungchow cotton and 16's yarn from a Chinese mill in Shanghai are taken as the standards :—

	Yarn. Taels per bale of 400-lb.		Raw Cotton. Taels per picul.	
	highest.	lowest.	highest.	lowest.
January ..	195	190	33.25	32.50
February ..	208	198	33.50	33.25
March ..	209	202	34.25	32.75
April ..	201	188	33.95	33.00
May ..	188	168	33.50	32.25
June ..	192	172	32.00	31.00
July ..	178.50	165	34.00	33.00
August ..	173.60	162.20	32.00	28.50
September..	164.50	150	30.00	28.50
October ..	155	148	28.50	24.50
November..	157	137	25.50	24.00
December ..	139	131	24.00	22.00

From January to April of this year the price of cotton remained practically stationary, that is from 22 to 24 taels per picul, while the price of 16's yarn fluctuated from 132 to 140 taels per bale. The causes of the decline are many, but the chief ones are the industrial depression in Japan, which caused a dull yarn market in that country and in turn affected the Chinese yarn market, the decline in the price of American cotton, and the increase in the number of spindles in China since last year.

Very few mills are equipped with English machinery. There are many British firms in Tientsin who are agents for British textile machinery, but they are doing very little business because they cannot give definite delivery dates. Textile machinery makers, as well as those who are interested in textiles in general, should bear this condition of delivery in mind. This is a new field, and with certainty the demand for both manufactured goods and machinery will be enormous as time goes on.

The New Canton

By Orrin Keith

THE metropolis of South China is rapidly growing away from its ancient reputation for narrow streets and overcrowded houses. There are still many of both but the new-comer now receives his first impression of broad avenues and modern, and in some cases really excellent, buildings. So rapidly is the change taking place that even those who leave the city for a stay of two or three months return and exclaim at the transformation.

The scheme of tearing down the old city wall and replacing it with boulevards was first broached in 1911 by T. T. Ching, a returned student, and then commissioner of public works in the days immediately following the revolution. Nothing came of the matter at that time, however, and the troublous years which followed allowed no opportunity for such improvements. Not until the end of 1919 was the plan revived. Then Ngai Pong-ping, commissioner of police under the Kwangsi government of Mo Wing-sun, tore down the city wall and began constructive work under Ching's plan. This government completed the paving of 37,000-ft. of highway.

That the end in view was something more than the modernization of Canton there is considerable evidence. Mo, or Mok as he is known locally, organized a syndicate among his friends and they bought up the property on both sides of the proposed roads. This property had an average value of perhaps $200 per *chien*. Mok, however, was military governor of the province, and, moreover, he belonged to the old school of officialdom. He decreed that this property was worth $5 per *chien* and forced the transfer of the title to his syndicate at this price. Even this was not paid too often and when the Kwangsi militarists and their henchmen were ejected at the end of 1920, they left creditors to the extent of $1,500,000 clamoring for the pittance they had been allowed for their land.

Another transaction of interest was the acquisition of the lands of the bannermen. Up in the north-west corner of the city were several hundred acres which, because of the distance from the gates, were so inaccessible as to be of comparatively little value. With the walls down, however, these would face a boulevard and be immediately opposite a very crowded portion of the extramural city. Their value would therefore be greatly enhanced. The syndicate tried to persuade the bannermen to turn these lands over to them on the agreement that the syndicate would assume the obligation to pay them as long as they lived the same income they had formerly received. Even a bannerman could see some doubtful points in such a scheme. So the syndicate changed its tactics and offered to buy the property at a price which would yield the same income. This sounded more reasonable. The money was to be deposited in the government bank. The deeds were to be turned over to the syndicate. Then the bannermen were to get their money. All went according to program until the last step was reached. When the bannermen called for their money after delivering their deeds, the bank was very sorry, but the government had requisitioned that money for other purposes!

If the beginning of Canton's transformation was closely associated with the sordid methods of the old mandarinate, the later developments make cleaner reading. At the end of 1920 the Canton municipality was formed. It fell heir to the work of city improvement, although it could make no effective claim to the $10,000,000 its predecessors are alleged to have made out of the project up to that time.

The new men at the helm seem to be of an entirely different mold. They have taken up and even extended the plans for municipal development but have so far kept themselves clear of all charges of graft or extortion. They have even paid a portion of the indebtedness which the old gang left and are making arrangements to pay the remainder. The entire system of acquiring the necessary lands and properties has been remodelled. Instead of the syndicate system and its corollary of private and official graft, they have instituted the American system of condemnation and assessment. The owners of properties taken are to receive due compensation and the owners of properties benefitted are to pay the cost of the improvement.

The most important development under the new plan is the continuation of the bund from its present termination opposite the east end of Shameen westward along the Shameen canal to the western end of the city. The present road is twenty feet wide. The new bund is to be eighty feet. The city commission has placed a value on the property which it is necessary to take for this purpose at an average of $250 per *chien*. If any property holder is dissatisfied with the amount allowed him for his property, he may ask for arbitration. The board of arbitration will consist of two members of the commission, one member appointed by the property owner, one member appointed by the chamber of commerce, and the provincial recorder of deeds. Their decision will be final. It may be contended that the property owner has but little representation on this board. The decision, however, has passed from those who place their own profit above all scruple, to a disinterested majority at least. This is a favor, and not a small one, for which the property owner ought to be, and is, duly thankful.

The property acquired and the street constructed, the next step is to apportion the cost among the holders of property fronting on the new bund. It is estimated that such property will be worth at least $325 per *chien*, though this is considered a very low estimate. The former value of each piece will then be assessed by the department of public works and the owner required to pay the difference between such assessment and $325. He has the same right of appeal to a board of arbitration as is provided in the case of the condemned property.

The plan in general is to put through these improvements in such a manner that the properties benefitted will just pay the actual cost. Neither the city nor any individual is expected to make anything. It requires considerable courage to really believe that nobody will make anything in such a series of transactions. And yet the present city government has kept itself remarkably free from even the suspicion of private profit.

The average width of the main avenues at the present time is about eight feet. It is intended to widen all the avenues to at least twenty feet. This is not to be done according to any fixed plan of reconstruction but as different parts of the city are destroyed by fire, the property owners will be required to rebuild under new regulations. This plan too is in part a heritage from the old *regimè*—but with a difference. Under the old government, when a district burned, the house-owners were required to build back to a new line. The exact location of this line, however, was carefully concealed. In fact, it was not fixed at all. The amount the owner had to go back from the old line therefore depended largely on how much squeeze he paid to the officials in charge. Under the new administration, whenever a street is burned, the entire street is surveyed and the ultimate lines are fixed and published. There is no favor and no graft. It is estimated that the entire city will be rebuilt under this "fire-and-reconstruction" method in about twenty years.

Meanwhile another improvement is receiving the attention of the department of public works. Parks or public gardens are not usually associated with Chinese cities. But the new Canton is to have these in adequate measure. Already there is one in the centre of the city which has been handsomely beautified after the Occidental fashion. Its area is about 7,000 *chien*. To the north of this, running up to the old north wall of the city, is the hill of the goddess of mercy. This is beautifully wooded and requires little in the way of artificial treatment to make it a delightful park. Heretofore it has been largely shut off by the location of various yamêns and other public properties so that its beauties have been accessible only to the favored few. Now it is planned to open it up by running the necessary boulevards and convert it into a public park.

A third plan calls for an extensive public playground in the eastern part of the city. This will have a large athletic field, track, ball-grounds, etc. Here the new China may disport itself after the manner of the young men—and young women—of the West. The fourth project is for a small park on the island just east of the end of the bund. The bund will be carried across the canal and the canal itself filled. This will be largely a show place as a terminus for the bund.

Even more ambitious is another project of the new administration. Canton makes no effort to hide under a bushel its light as the "livest" city in China. But if numbers are to be taken into account, it is a city of the dead. A survey recently completed gives the estimated number of graves within the present city limits as over 18,000,000 ! Eighteen million ancestors sharing Canton's supersaturated area with a million and a half of their living descendants !

The extent of this supersaturation is apparent from another survey. Canton has only 120,000 buildings. Of these 30,000 are stores, godowns and other business structures. The result of the survey is an estimate that, in spite of the number of people who have taken to boats—over 50,000 in the city itself—there is an average of twelve to fifteen persons in every dwelling house in Canton ! As a great many have only five or six, there are also many which run as high as twenty or thirty !

A really pressing problem then, is some provision for new dwellings. And the proposal to extend the city in any direction meets with immediate objection from some of the eighteen million ancestors ! This objection was conclusive in former times. But the new governors of Canton have decreed that if the necessity for homes for the living conflicts with the rights of the dead, then the dead must move ! And the migration has already begun. A tract of some 48,000 *chien* on the outskirts has been declared suitable for building purposes. The city has begun the work of exhuming the coffins. In one small corner of it during the month of November they found 20,000 coffins. These are exposed for identification and when identified are turned over to the relatives together with a payment of $3 to $10 to pay for reburial elsewhere. As fast as the graves are removed the property will be sold for homesites.

The money obtained from this development will be used to commence the construction of Canton's sewer system. There is a temporary sewer along the line of the old moat before the city wall and the new boulevards are provided with sewers, but no general arrangement has been made as yet. The need for such a system it is not necessary to dwell upon.

Among the lesser enterprises of the public works department are five public slaughter-houses and two public markets. Much of the disease of the city has been rightly or wrongly attributed to the practice of the private killing of animals and the exposure of the meat for sale uncovered in open stalls along the dirty streets. In time all animals will be slaughtered in the public slaughter-houses under sanitary inspection and the sanitary requirements for the sale of meat will be much more stringent.

One more plan of the new government, even though it is still in the making, is of interest. There are in Canton a number of old yamêns, and other government properties with extensive grounds. The land is extremely valuable but the buildings are in few cases suited to the present needs. It is proposed to sell all of these properties. This would serve the double purpose of giving more area for home building and bringing in to the city treasury a large sum of money. This money it is proposed to use in the construction of a civic centre with modern buildings to replace the present yamens. The site at present favored is on the island of Honam, across the river from the old city of Canton and not far from the Canton Christian College.

Such are the plans. They are ambitious. Not so long ago they would have been laughed at as vain dreamings. But to-day so many of them have been actually realized, and the way seems so clear for the rest of them, that they can no longer be laughed at. Canton is apparently determined to be a modern city. And Canton is rapidly becoming one.

New Amoy Telephone System

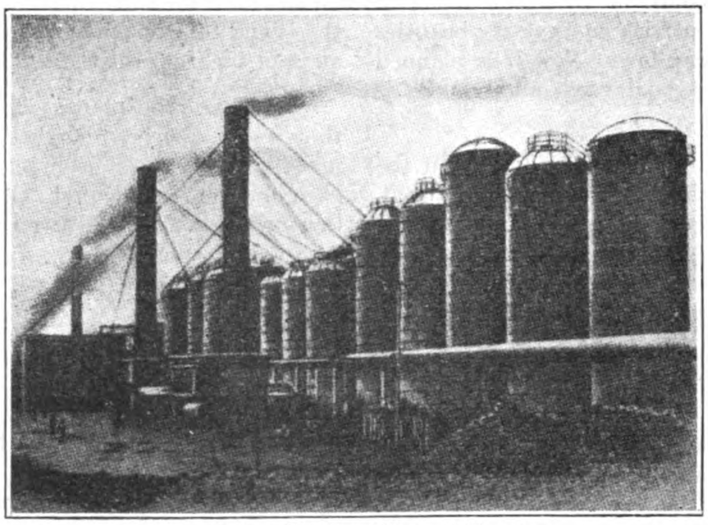
THE Kellogg Switchboard and Supply Company have just signed a contract for the installation of a complete new telephone installation for Amoy, which calls for a 1,500 line common battery system, with 1,000 wire miles of copper cables. Submarine cables for ten simultaneous connections will connect the island of Amoy with the Foreign Settlement of Kulangsu Island. The contract also includes poles, cross arms, insulators, and all pole line hardware. No part of the old system will be used in the new installation.

Mr. Oei Tjoe

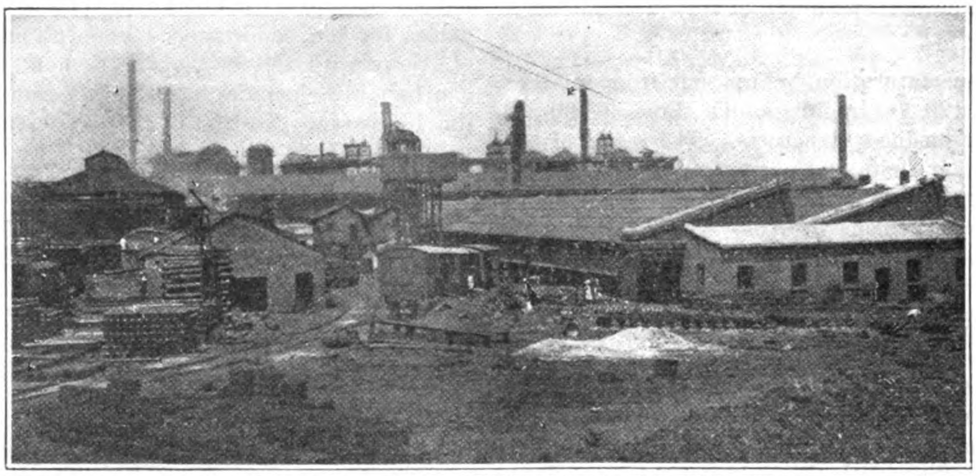
The new enterprise is due to the civic patriotism of Mr. Oei Tjoe (I. Joe Hwang) a Chinese multi-millionaire whose signature is said to be good for 5,000,000 pounds sterling. A native of Amoy, he drifted to Java and entered the business of coolie contracting for the sugar estates and other enterprises, and in course of time invested his earnings in sugar properties. The wave of war-time prosperity carried him into the millionaire class. He is credited with founding the China and South Sea Bank, Ltd. in which he is the largest stockholder. Returning to Amoy to enjoy the remaining years of his life in his ancestral home, he determined to contribute something to the welfare of his city. The extremely poor service of the local telephone system provided him with this opportunity and the outcome is the contract with the Kellogg Switchboard and Supply Company for a complete new plant.

ASIATIC STEEL WORKS.—1. The Bengal Iron Works

THE Bengal Iron Co., Ltd. was registered in December, 1919, with an authorized capital of £2,500,000 to acquire the Bengal Iron & Steel Co., Ltd. The works are situated at Kulti in Bengal on the East Indian Railway, 142 miles from Calcutta. It has already been shown how the latter company, founded in 1889, was the lineal descendant of the Barakar Iron Works Co., Ltd., which was started in 1875. In 1889 the plant consisted of two small open-top furnaces, only one of which was worked, for which the blast was heated by coal in pipe stoves, and one blowing engine with its complement of boilers which were entirely fired by coal. The production of pig iron in 1889-90 was about 9,000 tons per annum, and was disposed of to government establishments either in that form or in the shape of castings. The foundries then covered an area of 12,300 sq. ft., and the production from them was 3,800 tons per annum. At that time the company did not own its own collieries, but purchased its coal and coke requirements in the open market. The site of the works was chosen originally on account of the close proximity of both coal and iron ore supplies, and for many years the clay ironstone nodules that formed the ores for the furnaces were obtained from a geological horizon in the Gondwanas, known as the Ironstone Shales. This crops out between the coal-bearing Barakar and Raniganj stages, and stretches for some distance east and west of the works. The iron ore was obtained by contract with the local proprietors of bullock carts, and the supply was uncertain in quantity and variable in quality.



Bengal Iron Works: View of Furnaces



Back View of Bengal Iron Works, Showing Pipe Foundry

The remodelling of the works was taken in hand at once. The two original blast-furnaces were converted into close-top furnaces to enable the gas to be utilized for firing the boilers. At a later date, as they required rebuilding, they were removed and replaced by two modern furnaces. A new furnace was also erected, fitted with three 17-ft. diameter Cowper stoves. During the period up to 1914 steady progress was made; collieries were purchased and developed, namely, Noonodih, in the Jherria field, in 1905, and Ramnagar, 1½ miles distant from the works, and connected with them by a light railway, in 1907. By 1908 several small iron ore areas had been acquired, one of which was at Kalimati (now Jamshedpur), close to the site of the present Tata iron and steel works. With the opening up of the company's mines at Manharpur, in the Kolhan Estate of Singhbhum, in 1910, a constant supply of first-class hematite was assured, for already many millions of tons of high-grade material have been proved, and the use of the ore from the Ironstone Shales was finally discontinued. The outbreak of the war found three furnaces in operation with an annual output of approximately 80,000 tons of pig-iron, each furnace with its four Cowper hot-blast stoves, and the whole plant operated from a modern power-house containing three turbo-blowing engines of a total horse-power of over 4,000. The plant in existence today will now be described.

Pipe Stock Yard. All Pipes are Made to British Standard Specification

There are four furnaces in operation, a fifth under construction, and twenty stoves for heating the blast; seventeen of the latter are 65-ft. high by 21-ft. in diameter, and three are 55-ft. high by 17-ft. in diameter. On the completion of the fifth furnace the total capacity of the plant will be 175,000 tons of pig iron per annum. The blast is supplied from turbo-blowers of the Parsons type, with a total capacity of 115,000 cub. ft. of air per minute. There are twenty-four Lancashire boilers, fired by waste furnace gas, in two batteries, supplying steam to the blowing engines. The iron ore, coke and limestone are delivered from railway wagons and raised to the charging hoppers by two steam and electric hoists. In the case of No. 5 furnace, a Brown Hoisting Co.'s charging apparatus has been provided. The slag is removed in Dewhurst ladles and taken to the tip in a molten state.

The coking plant consists of three batteries each of thirty-four Simon Carves by-product ovens, with an out-turn capacity of 130,000 tons per annum, complete with recovery plant for coal tar and ammonia, and also sulphuric acid plant. A fourth battery is under construction which will raise the total output to 200,000 tons per annum. The present raisings of coal from the company's collieries (Khendwa

and Ramnagar in the Raniganj field and Noonodih in Jherria) are about 150,000 tons per annum, but are being increased to 250,000 tons. The requirements of the coking plant are drawn from these and other sources. The coal is discharged from railway wagons into hoppers, whence it is elevated to the crushing machines and thence to the storage bunkers. It is compressed before entering the ovens.

The waste heat from the ovens passes to a battery of boilers, where it is used in raising steam for the electric generating plant, which has a capacity of 2,500 kw. and provides power and light throughout the works, to the Ramnagar colliery, and to the pumping station at Monberia on the Barakar River.

The area occupied by the foundries has increased from 12,300 sq. ft. in 1890 to 175,000 sq. ft. to-day. This department comprises pipe foundries, railway sleeper and chair foundry, general casting foundry and brass foundry, together with pattern shops, etc. Pipes are made in dry sand moulds and vertically cast. One plant is fitted with hydraulic and the other with electric power. Flanged pipes of all sizes for steam or water mains are made. During the war the company supplied many miles of pipes for Mesopotamia and the north-west frontier, in addition to 20,000 tons of high-grade ferro-manganese made from Indian ore and dispatched to America, France and Italy. Large quantities of railway sleepers were also supplied for extensions in various military zones. The railway sleeper foundry is fitted with moulding machines for making both plate and bowl designs.

In the general foundry all kinds of castings up to 10 tons in weight are manufactured, including columns for buildings and mills, straining posts and sockets for fencing, mortar mills, road rollers and machinery castings, ornamental columns, lamp-posts, railings, etc. The foundries are capable of turning out 60,000 tons of castings per annum divided as follows : pipe 15,000 tons, sleepers and chairs 30,000 tons, general castings 15,000 tons.

The Bengal Iron Co., Ltd., to-day employs about 100 Europeans and 15,000 Indians, and every effort is made to cater for the physical well-being and comfort of both. A modern hospital administers free medical treatment. Foodstuffs are issued at cost price, while schools for boys and girls have been built and are principally financed by the company.

2. The Lungyen Steel Works

ONE of the most interesting and useful additions to industrial China is the 250-ton blast furnace plant of the Lungyen Mining Administration, now under construction at Shiechingshan, eleven miles west of Peking on the Mentakow branch of the Peking-Suiyuan Railway.

The site is an admirable one, there being ample room on the great flat plain for the very extensive future expansion contemplated, sufficient water supply and connections with two railways ; the administration owning its own six-mile line making connection with the Peking-Hankow line at Loukowchow. The elevations chosen and the layout determined are such that the traffic about the plant will be conducted under ideal conditions, second to none anywhere. Ore, coke and limestone are received and go to the stock handling system or to the stock piles without crossing any other yard track at grade. Iron, slag and incoming materials have each their own separate lines. Traffic interference will be reduced to a minimum. The location of the present plant was formerly a low rock hill which has been leveled leaving the foundations of all structures in solid rock.

The plant was designed by Perin and Marshall, of New York, and the materials are all of American manufacture.

Mr. G. Gordon Green is engineer-in-charge of construction.

The furnace is of latest American design, 85 feet from hearth to charging platform, 13-foot hearth and 18-foot bosh. The eight columns are of built up structural steel and there are eight tuyeres offset from the columns to give maximum working space. The hearth jacket is of steel plate, lined with cast iron cooling plates. Two iron notches are provided, one above the other, to facilitate tapping when the furnace is working badly. Two cinder notches are also provided, at the same elevation and ninety degrees from each other, to give relief in case of accident to one of them. The tuyere and bosh jackets are of heavy steel plate with the usual type of bronze cooling boxes. An added ring of permanent cast iron cooling boxes is inserted in the brick lining above the mantle, near the bottom of the first ring of shell plates. The brick lining was made in America, the top fifteen feet being protected from the incoming charge by cast iron wearing plates laid in small units in the lining itself. The furnace top is a Marshall design with double skip hoist, distributing hopper and two bells enclosed in a gas tight housing. Four bleeder pipes extending 43 feet above the charging platform carry the poisonous gases well above all working levels. These four bleeder pipes also carry the bell lever, skip sheave and bleeder valve platforms. From them also, at a height of 15 feet above the charging platform, are taken the two downcomers, instead of from the shell itself, thus minimizing the amount of coarse material and heavy dust carried out by the gas. The gas passes from the downcomers through two 20-foot dustcatchers where the bulk of its dust is removed, thence through the gas mains to the stoves, where it is burned to heat the blast, and to the boilers.

The iron notch is closed by a Vaughn steam mud gun, and the arrangement of the furnace floor is such that the operator can see the operation of the stock and filling systems at all times.

There are four stoves, 20 by 80 feet high, of a simplified design, two pass, with side combustion chamber. The stoves are fitted with an inverted type of Spearman burner, mushroom hot blast valves, spectacle chimney valves and slide cold blast valves. A stairway runs from the ground to the platform around the top of the stoves, whence another stairway continues to the furnace charging platform.

There is also another stairway from the ground to the furnace top, up the skip bridge.

The design of the stoves is a Marshall two pass type with the checkers of standard bricks instead of special shapes. Special provision is made for uniform gas supply to all checker flues.

From the stoves the waste gases are carried off through an overhead flue to a steel stack, 175 feet high, 8 feet diameter, and brick lined throughout.

The gas burners at the boilers are of the venturi type, giving automatic control of air admission at all gas velocities. There are five 500-horse-power Wickes vertical water-tube boilers with Foster superheaters, working at 200-lb. pressure and delivering steam at 165 degrees of superheat. Waste boiler gases are carried off by three 150-foot steel stacks, brick lined throughout, one chimney to each pair of boilers.

Steam is delivered to the adjacent power house, fifty by one hundred and twenty feet floor space, wherein are housed two 20 by 30-inch Norberg uniflow engines direct connected to two 250 K.W. generators, one only running ; two Ingersool-Rand turbo blowers, one only running ; Worthington boiler feed pumps, air compressor for casual use about the plant, and jet condenser. Generators supply power to pumps, machine shop and larry car, to various motors about the plant, and for lighting.

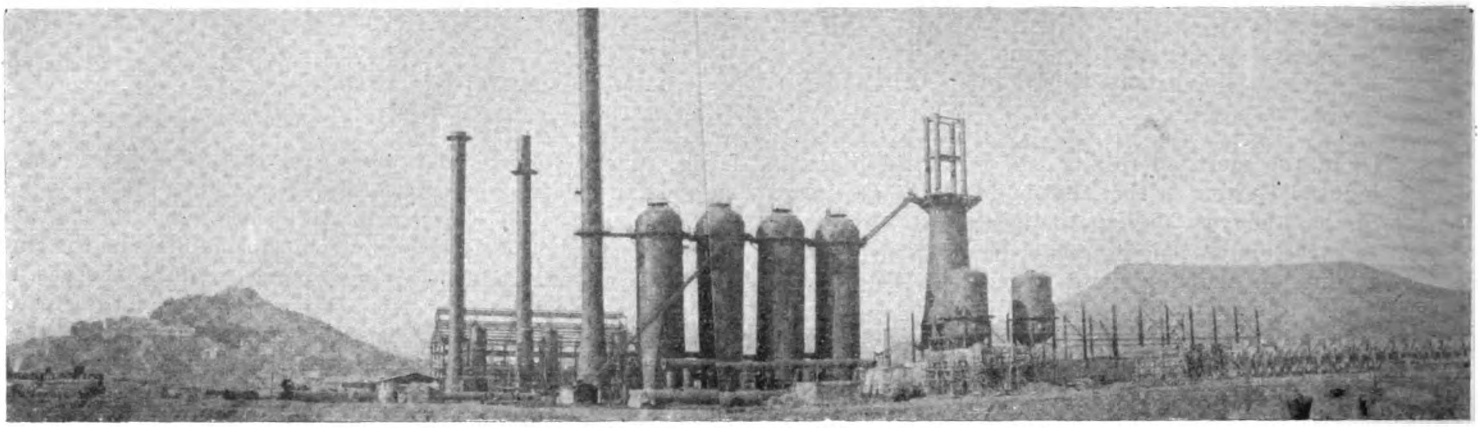
Both boiler house and power house are of structural steel, roofed with corrugated sheets, the boiler house having corrugated steel sides, the power house having brick walls.

Ore and limestone are delivered to the furnace through a concrete tunnel stock system and there are no bins for these materials. The tunnel, 360 feet long and 17 feet inside width, the top being level with yard level, carries a concrete trestle with two standard gauge railway tracks twenty feet above. Ore and limestone are discharged from the cars through the trestle and fall directly on the tunnel arch and on the ground. They then pass through openings in the tunnel arch by chutes and shut-off gate into the scale car traversing the tunnel. This car, automatically weighting its load, carries it to the skip pit opposite the furnace, which is twenty feet below its own tracks, where it discharges by gravity into the skip car which delivers it to the furnace top. The skip cars are hoisted by a double-drum reversing Otis elevator steam hoist, the two cars traveling in opposite directions at the same time.

Coke is stored in a steel bin directly over the ship pit. As the coke drops into the scale car, it passes over a grizzly, and the braize, or fine coke, is screened out. This braize falls on to a concrete platform and is wheeled out by hand up a ramp to the dump.

open hearth steel furnaces, rolling mills, bar and merchant mills, rod mills, sheet mills and other units of a great modern steel plant.

The Lungyen Mining Administration was organized in 1918, and is capitalized at five million dollars Mex., half of which is subscribed by the Chinese government, the other half being owned by individuals, most of whom are prominent men in China. The company has been granted mining rights to exploit the Pang-chia-pao and Sin-gao iron ore deposits of Ling-kwan hsien, the Yen-tung-shan deposits of Hsuan-hua hsien and the Shih-fu-shan deposits of China-hsing hsien, all in the province of Chihli. The total workable reserves of high grade ore of the three areas are estimated to be one hundred million tons. The ores are all hematite of sedimentary origin and carry a little over 50% metallic iron. The Peking-Suiyuan Railway has built a six-mile branch line from Hsuan-hua to Yen-tung-shan, and a system of narrow gauge lines connects the various workings with the standard gauge railway; the cars loaded in the mines are discharged directly into the standard gauge cars. The mines began regular work in January 1919, employing about 2,000 men and produced 700 tons of ore daily. The mining work so far accomplished consists of an interesting system of tunnels and inclines. At the mines there are coolie quarters for 2,000 men, office buildings and a well equipped laboratory.



New Blast Furnace of the Lungyen Mining Administration, near Peking

One of the interesting problems is water supply. The plant requires ten million gallons daily, eight millions is recovered but two millions is lost and must be made up. The water supply, the Hun Ho or Yung Ting River, contains normally about one per cent. of sediment which must be removed. A pumping station at the river side, three quarters of a mile from the furnace, equipped with two electrically driven centrifugal pumps, each of two and a half million gallons daily capacity, deliver the river water to the settling tanks, where the sediment is removed and run to low ground nearby for the use of the farmers. An earthwork reservoir of sixty million gallons is located near the furnace and a concrete reservoir an enlarged pump of half a million gallons capacity, together with a pump house, water treating plant and a ninety-foot water tower is located adjacent to the power house.

For the present, iron is to be cast in the sand in the cast house, two hundred and forty-four feet long by sixty feet wide, and carried out when cooled by hand, or with a traveling crane. Slag goes to the ample dumping grounds by Pollock side-dump steam-dump cinder pots. Other auxiliaries include two Baldwin saddle tanks, sixty-ton locomotives, one fifteen-ton industrial locomotive crane, an ever expanding machine shop and blacksmith shop and a foundry.

The grading and excavation was commenced early in 1921 and the concrete work in May. Steel erection was commenced in July, and according to the present schedule, based on work already done, the furnace should make iron sometime next spring. If this is achieved it will be a time record upon which the administration may justly pride itself.

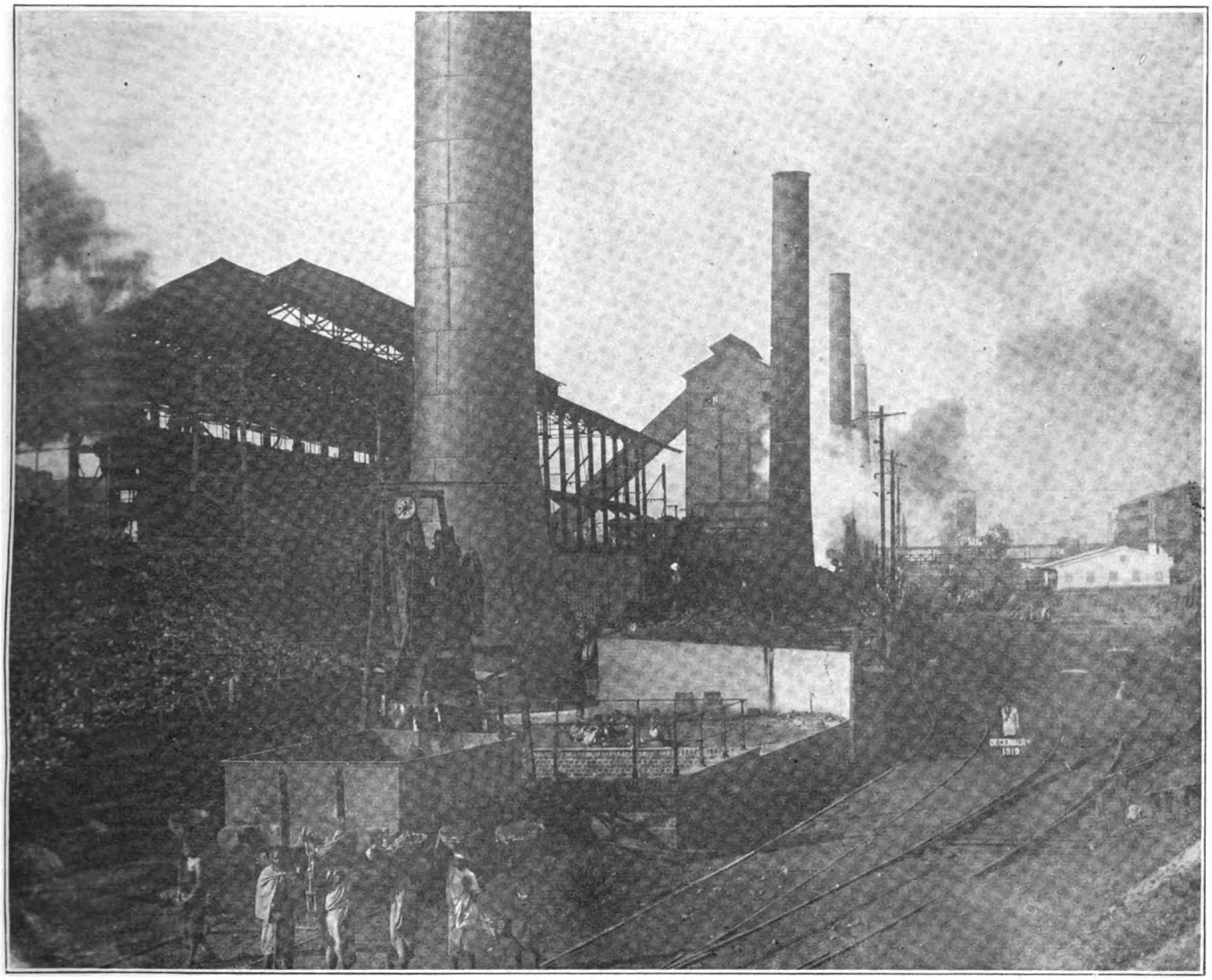
This plant is the first unit of a steel plant which includes for future construction other blast furnaces, by-product coke ovens,

The company has also wisely acquired several large tracts of land nearby and has planted trees to provide timbers for future mining purposes, a new acreage being planted yearly. The engineering staff consists of 20 men, all Chinese, and in 1919 over 150,000 tons of ore were produced. Mining work can be carried on practically every day in the year.

In order to determine the working qualities of the ore a trial smelting was conducted at the Hanyang Iron and Steel Works furnace at Hankow, from May to August 1919, using Lu-ho-kow coke and Tayeh limestone. The ore proved easy to reduce, and the fuel consumption was low, but with a comparatively large slag volume as might be expected from the analysis. The furnace worked remarkably well and the trials were eminently successful. The iron produced contained 3 to 4 per cent. total carbon, .4 to .9 per cent. combined carbon, 1 to 3.5 per cent. silicon, .2 to .4 per cent. phosphorus and .015 to .050 sulphur, these being maximum and minimum figures. The grades ranged from basic to one foundry.

Lungyen owns its limestone quarries 7 miles from the furnace site, and also its own standard gauge branch 4 miles long, connecting it with the Peking-Suiyuan Railway at Sanchiatien, near Mentakow.

The iron and steel production of any nation is always a vital factor in its business strength. It is a most satisfying sign of the times to see that China is increasing the development, for her own use, of iron, the most important of her natural resources, and it is certainly greatly to her credit, that the vision, the initiative, the capital, and so far as is now practical, the personnel, is and has been, wholly Chinese.—*Journal of the Association of Chinese & American Engineers.*



THE TATA IRON AND STEEL WORKS: COKE OVENS

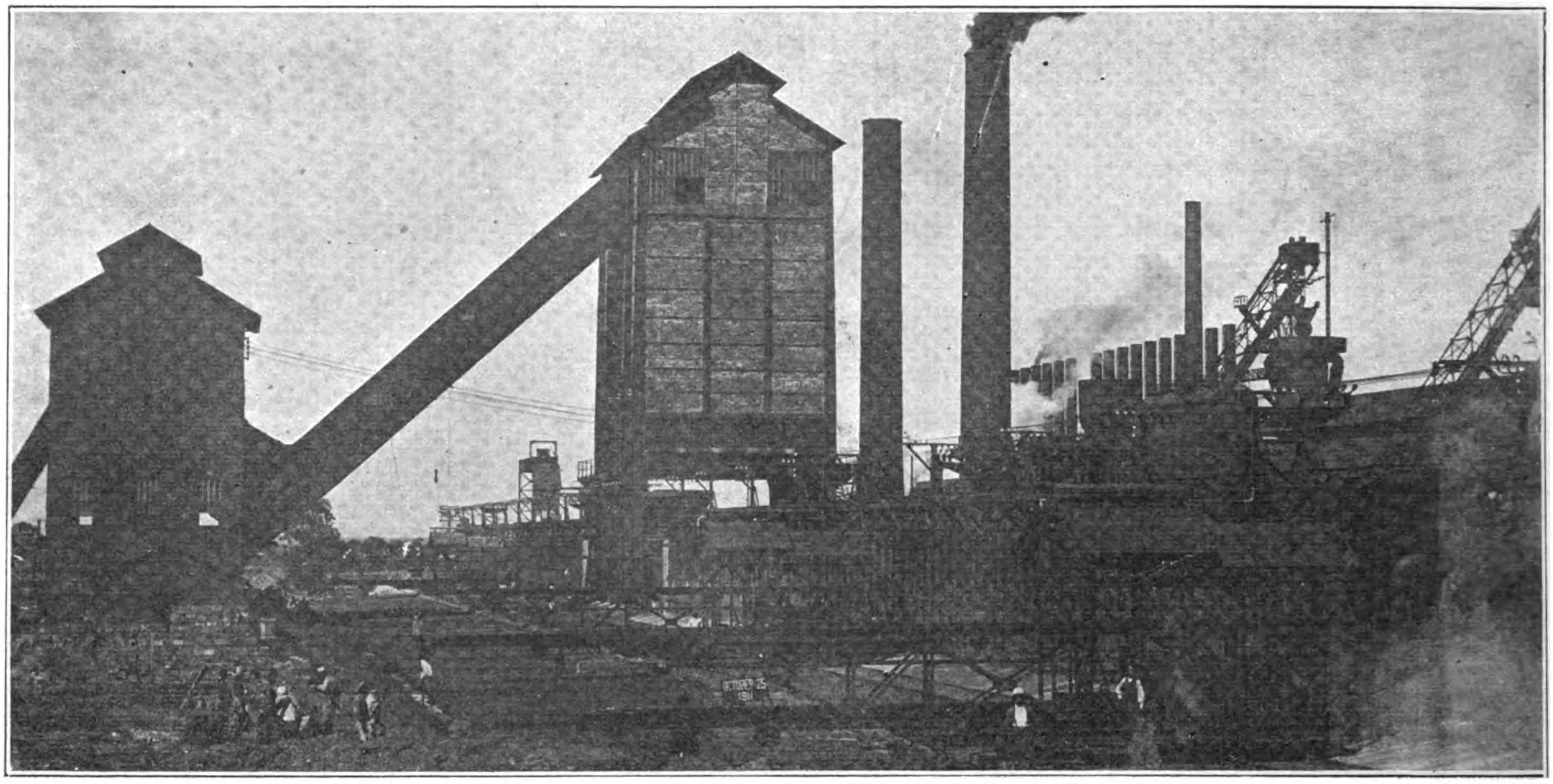
3. The Tata Iron and Steel Works*

JAMSETJI Nusservanji Tata, a member of the priestly caste of the Parsees, who was born in the State of Baroda in 1839, was the first Indian to realize the possibilities of an extensive iron and steel industry in his native land, and he also possessed the foresight to visualize the potential developments which have since come to pass. The operations of the Bengal Iron & Steel Co., Ltd., had already proved beyond question that pig iron could be made profitably in India, and it remained for Mr. Tata to institute the second iron-manufacturing concern and to introduce modern steel works and rolling mills.

The Tata Iron & Steel Co., Ltd., was formed in 1907 with a capital of Rs. 2,31,75,000 (£1,545,000). To-day it has an authorized capital of Rs. 10,52,12,500 (£7,014,166), of which Rs. 3,98,04,570 are issued. After preliminary investigations in India, Europe and America, Mr. Tata engaged Mr. C. P. Perin, of New York, as his consulting engineer. The latter's associate, Mr. C. M. Weld, arrived in India in 1902, and for some years examined various iron ore deposits, many of which had been discovered in the first instance by the officers of the geological survey of India. The earlier work was carried out in the central provinces, and large reserves of excellent ore were proved, but the forest resources of that region did not prove big enough to warrant the establishment of a charcoal iron works there. The surveys were then continued further on towards the east, in order to approach the coalfields of Bengal more closely, and finally the deposits of Gurumaishini in Mayurbhanj were chosen as the source of the iron ores.

The works are situated at Jamshedpur (formerly known as Sakchi), adjoining Kalimati station on the Bengal-Nagpur Railway. This place is 154 miles west of Calcutta, about 115 miles from the Jherria coal mines, 100 miles from the limestone quarries, and 45 miles from the Gurumaishini iron ore mines. The following description of the Tata works is compiled from papers by Messrs. Perin, Tutwiler and Surtees Tuckwell. The writer is especially

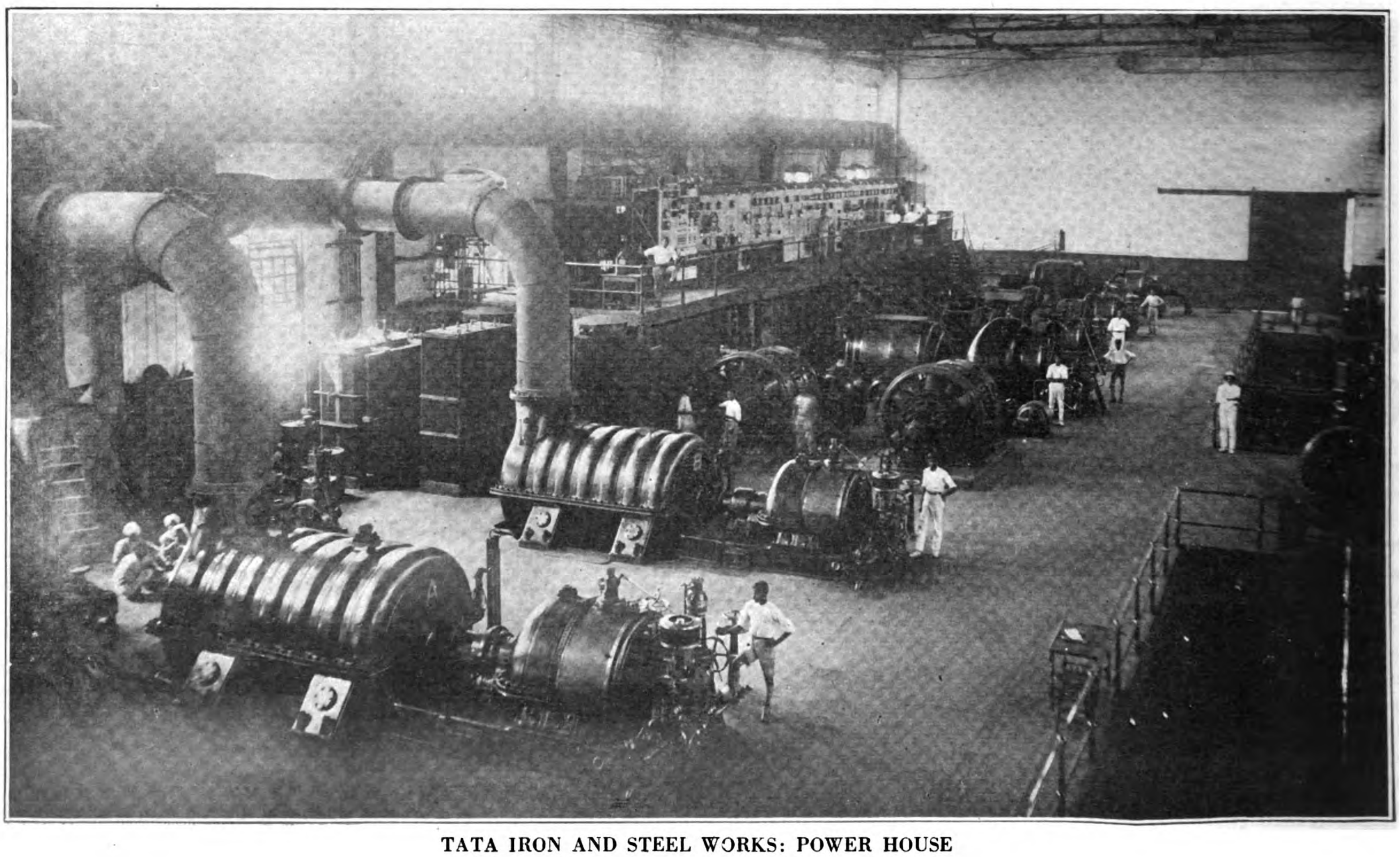
*This article appeared originally in *The Mining Magazine* of London, but has been corrected and brought up-to-date by the management of the Tata Iron and Steel Works.



TATA IRON AND STEEL WORKS: ANOTHER RECENT VIEW OF COKE OVENS

indebted to the last-named for his kind assistance. Construction commenced in 1908, and the Sakchi jungle was rapidly transformed into a town, which now promises to become the centre of one of the leading industrial regions of Asia.

The two original blast-furnaces of the company, each 77-ft. high and 19-ft. in diameter, with a capacity of 200 tons of pig iron per day, were blown-in in November, 1911, and September, 1912, respectively. Each furnace is equipped with up-to-date charging apparatus and four Cooper-Kennedy stoves. These two furnaces have since been enlarged to turn out 280 tons per day each. The shortage of ferro-manganese in India during the war led to the rapid erection of a third furnace of a somewhat smaller type in 1919. At the present time two of the most modern skip-filled furnaces, with a capacity of 600 tons per day each, are nearing completion.



TATA IRON AND STEEL WORKS: POWER HOUSE

The original coke-oven plant consisted of 180 Coppee non-recovery ovens. To these have been added a battery of fifty Koppers by-product ovens and a Simon Carves sulphuric acid plant, which supplies the acid necessary for the production of sulphate of ammonia. Three batteries of Wilputte design, each containing fifty ovens, are being added, together with extensions to the coal tar, ammonium sulphate, and benzol recovery plants. All the silica shapes requisite for the construction of these new ovens have been made in India by the Kumardhubi Brick Co.

The steel works plant consists of one 300-ton mixer, which receives the molten pig iron from the blast-furnaces before it is charged into the open-hearth furnaces. There are seven of the latter, four of which have a capacity of about 55 tons per heat and three of 75 tons capacity. These enable an output of 27,000 tons a month to be maintained. The new steel plant includes two 25-ton Bessemer converters, two 100-ton tilting open-hearth furnaces, and one 1,300-ton mixer. The converters will remove all the silicon and as much carbon as is desired from the iron, leaving the tilting furnace the duty of removing the phosphorus and sulphur and bringing the iron to the required percentage of carbon. The elimination of these elements is said to reduce the time necessary for the finishing of a heat in the tilting furnace by about 75 per cent. The large mixer is being erected to store the hot metal from the blast-furnaces over the week-ends, when the open-hearth plant is not working. The present 300-ton mixer is to be used as an additional open-hearth furnace after the new mixer is built. Provision has also been made for the installation of a 250-ton recarburizing mixer, a third converter if necessary, a third duplex tilting open-hearth furnace, and three Heroult electric furnaces for the manufacture of special steels or ferro-alloys.

There are four soaking pits in the steel works, equipped with mechanically operated lids, and an electric overhead charging and drawing crane. The ingots are made 21-in. by 19-in., and weigh between 2 and 3 tons each. They are removed by a self-tipping electric trolley to the mill tables.

The blooming mill consists of a 40-in. mill, operated by a Galloway engine of 11,000 h.p. In this mill the ingots from the soaking pits are made into blooms and billets. Another 40-in. reversing motor-driven blooming mill with hydraulic manipulator and followed by hydraulic shears is being added.

The present 28-in. finishing mill has three sets of rolls, and is worked by a 12,000 h.p. engine. It is capable of turning out rails from 100-lb. to 30-lb.; beams from 15-in. by 6-in. down to 5-in. by 3-in.; angles from 6-in. by 6-in. to 3-in. by 3-in.; and channels from 12-in. by 4-in. to 6-in. by 3-in. The blooms from the blooming mill are reheated before they are rolled, and the sections of rails or structural materials, after being rolled to the required dimensions, are cut by circular saws into the necessary lengths, and are conveyed mechanically by rollers to a cooling bed of the moving type. From the cooling bed all the bars and rails are passed through straightening machines in the finishing department, which also contains the usual planing and drilling devices. The products are handled by an overhead electric crane. The motor-driven blooming mill will serve a new 28-in. to 30-in. combination rail and structural mill.

There is one 16-in. bar mill making light rails weighing 30-lb. to 14-lb. to the yard; angles of all sizes from 3-in. to $1\frac{1}{2}$-in.; channels from 4-in. to $1\frac{1}{2}$-in.; beams of 4-in. by $1\frac{3}{4}$-in.; and fish-plates for rails. There are also two 10-in. mills devoted to the production of lighter sixes of flats, squares and rounds. The new bar mill is of the latest continuous type, and will take billets from the sheet, bar and billet mill at present under erection. Independent motor-driven rolls are being added for the production of wire rods.

The plate mill is now nearly completed in a separate building over 1,000-ft. long and about 100-ft. wide. The mill will produce plates from $\frac{1}{8}$-in. to $1\frac{1}{4}$-in. thick in various widths up to 96-in. and various lengths up to 50-ft. It is to be driven by a 2,000 h.p. motor taking alternating current at 3,000 volts, and is provided with bottom-type reheating furnaces. The building also contains the straightening and shearing machines for the plates.

The sheet, bar, and billet mill is in direct line with the new blooming mill, and will roll billets from $3\frac{3}{4}$-in. square to $6\frac{1}{2}$-in. square for the bar mills. It will also roll sheet bars up to 8-in. wide for the sheet mill. It is proposed to finish steel sleeper sections up to 16-in. wide on this mill.

The sheet bars will be delivered from the mill just described to the sheet mill proper, where six special furnaces will reheat them. The rolling equipment consists of two jump rolls, two balanced rolls, six finishing mills, and two cold rolling mills, all driven by a 4,000 h.p. motor taking alternating current at 3,000 volts. This mill will produce sheets to any width up to 38-in., and of any thickness desired from $\frac{1}{8}$-in. down to 0.01-in.

The present scheme of extensions also contemplates a bolt and nut shop with a sufficient number of machines to produce 50 tons per week; a steel sleeper press: a cast-iron pipe foundry; and a new roll-turning shop. A large new machine-shop is under erection, in which the housings, castings and the bulk of the heavy components for the new rolling mills, etc., are now being made. In addition there are shops for pattern-makers, carpenters, blacksmiths, locomotive repairs, electrical repairs and structural shops for bridge, roofs and buildings.

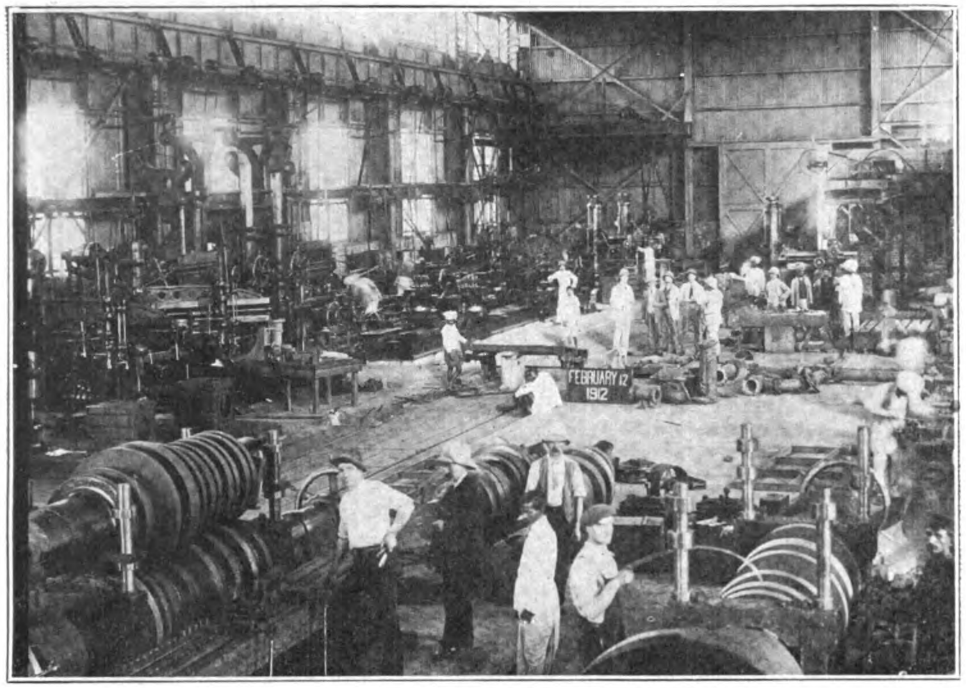
The power-house contains four turbo-blowers, which supply 32,000 cubic feet per minute to the blast-furnaces under a pressure of 15.5-lb. per square inch. The plant consists of one 5,000 kilowatt, two 1,000 kilowatt and one 1,500 kilowatt, 3,000 volt turbo-alternators, running at a speed of 3,000 revolutions per minute, and three transformers of 1,250 K.V.A., 3,000 to 440 volts, and two motor generator sets of 500 kilowatts each.

To supply the power for the new extensions, the whole of which will come into operation progressively within the next two years large additions to the former power-plant have been necessary. These include a large battery of new boilers, fired with blast-furnace gas, two 10,000 kilowatt, one 5,000 kilowatt, one 4,200 turbo-generators, one 2,000 kilowatt mixed pressure turbine, the steam for which is principally obtain from the existing rolling mill engines, and the necessary transforming equipment to step down from high to low-tension. Corresponding increases have been arranged in the water system, pumping plant, the transporting department, laboratory, offices, etc., to say nothing of the essential augmented reserves of raw material.

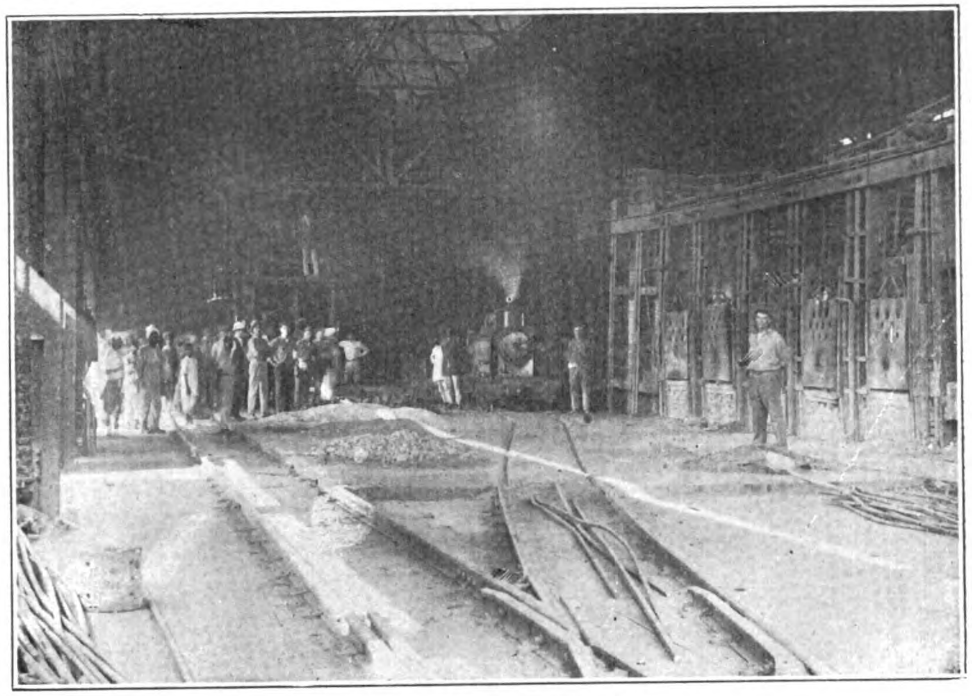
When the present extensions are completed, the Tata iron and steel works will have a potential output of 700,000 tons of pig iron and 580,000 tons of steel ingots per annum. Of the latter, it is proposed to convert some 426,000 tons into finished and semi-finished products, and the whole of the new plant has been so laid out that future extensions may be added with the least inconvenience.

The company owns its own collieries, iron ore mines, manganese ore mines, wolfram mines, and limestone and magnesite quarries. It also holds a large interest in the Kumardhubi Silica & Fire Brick Co., Ltd., which makes silica bricks from the gannister deposits of the Gaya region, magnesia products from Mysore magnesite, and other refractories from fire-clay, chromite, etc. The Tata Company to-day finds employment for 35,000 men and women, and, as it is still the custom of the ignorant to under estimate the capability of the Indian workman, it may be pointed out that the management has gradually been able to reduce the number of European and American employees and to substitute Indian labor. Out of 137 covenanted Europeans and Americans, 75 are employed as supervisors at the steel furnaces and rolling mills, which between them find employment for 4,200 men. At the blast-furnaces there are only 8 Europeans to 1,600 Indians; in the mechanical department 6 to 3,000; and in the traffic department only 1 to 1,500. The chemical laboratory originally employed five European chemists. Now only the chief is a European, the remainder of the staff being twenty-one Indians. According to Mr. H. Surtees Tuckwell, "in very many instances Indian workmen have shown themselves possessed of extraordinary skill and manual dexterity, and the electrical department is under the superintendence of an Indian gentleman, a graduate of an Indian

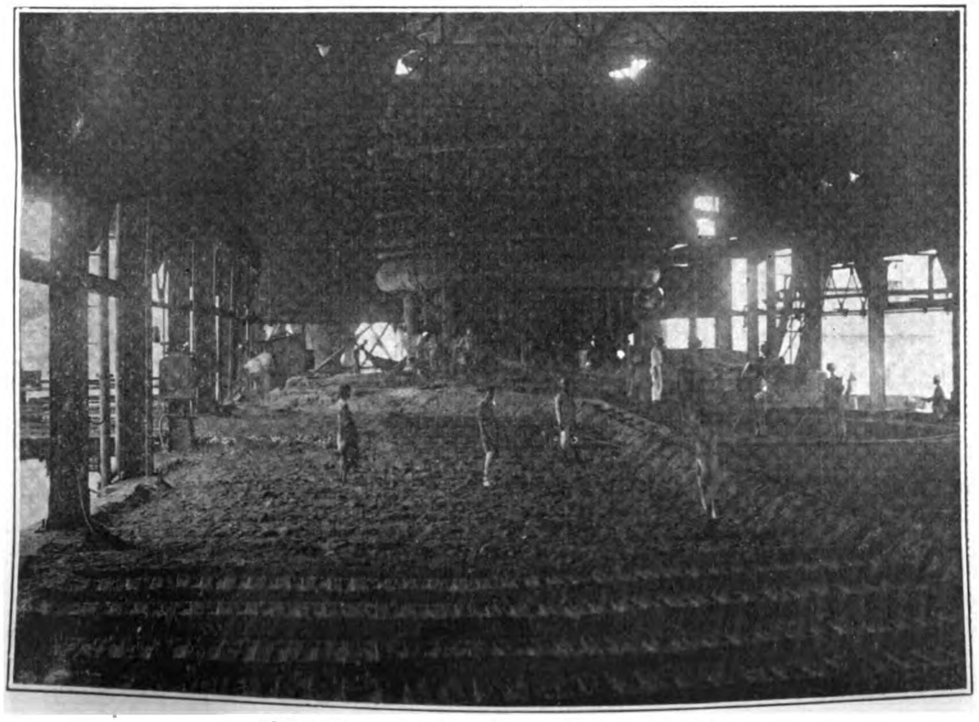
TATA IRON AND STEEL WORKS



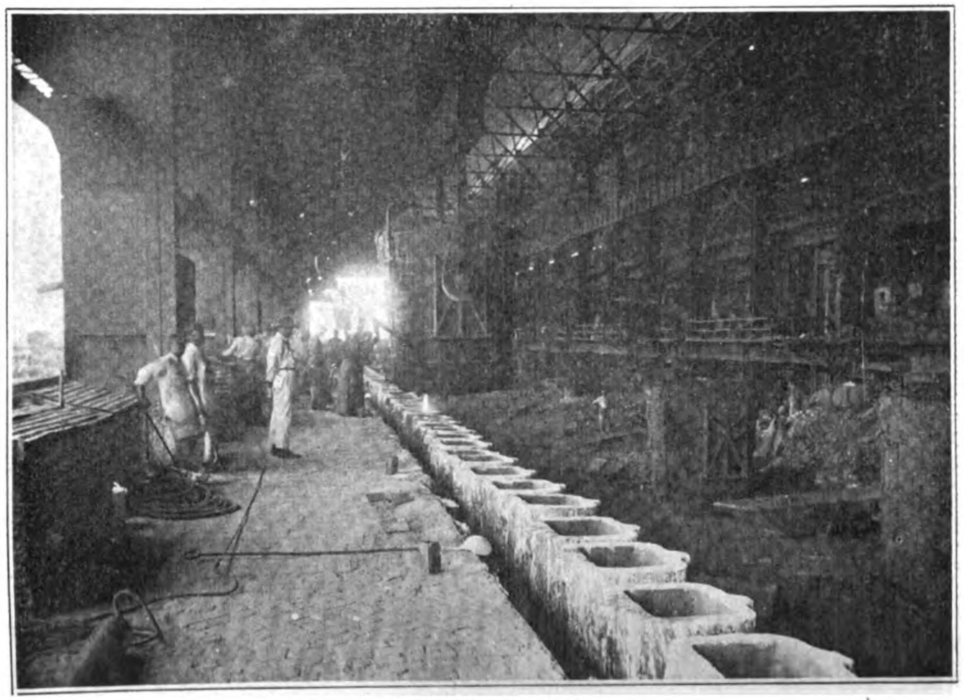
Machine Shop



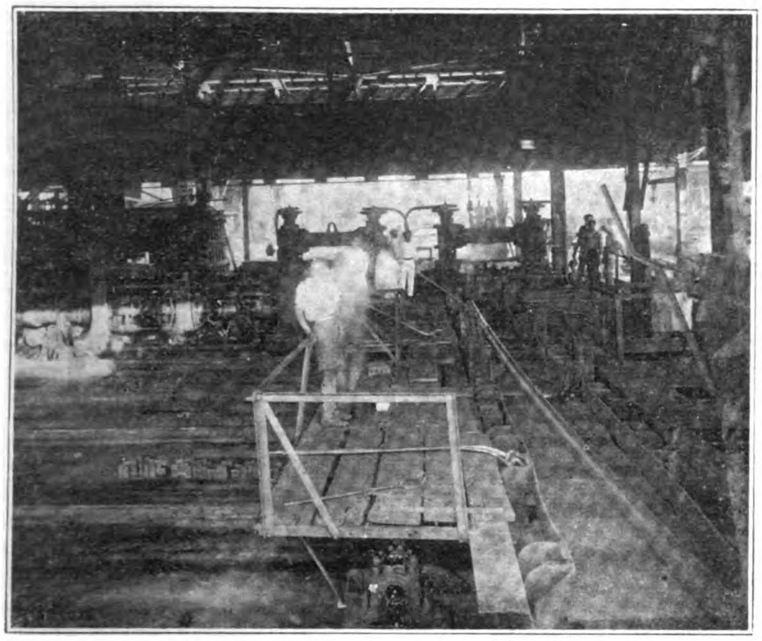
Steel Works, Charging Side



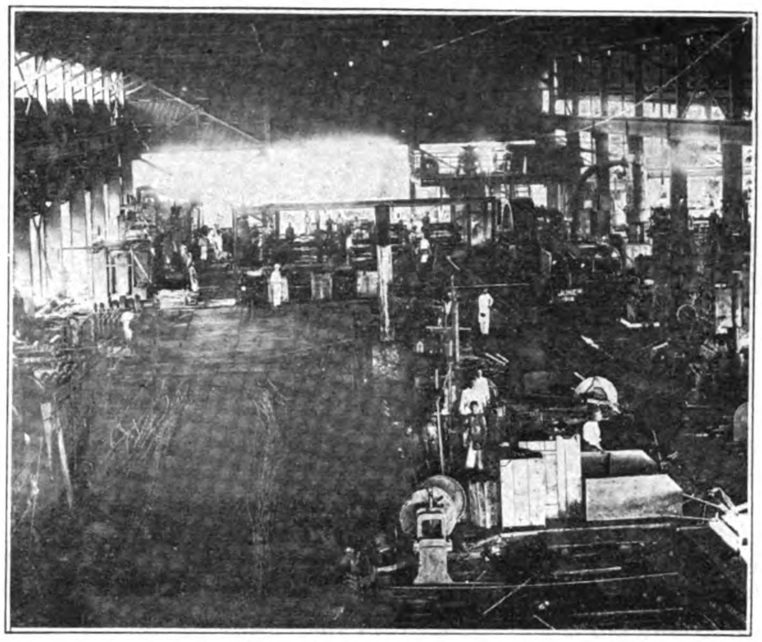
Blast Furnace Case House, Interior View



Steel Works, Pouring Side



Tata Iron and Steel Works: Rail Mill

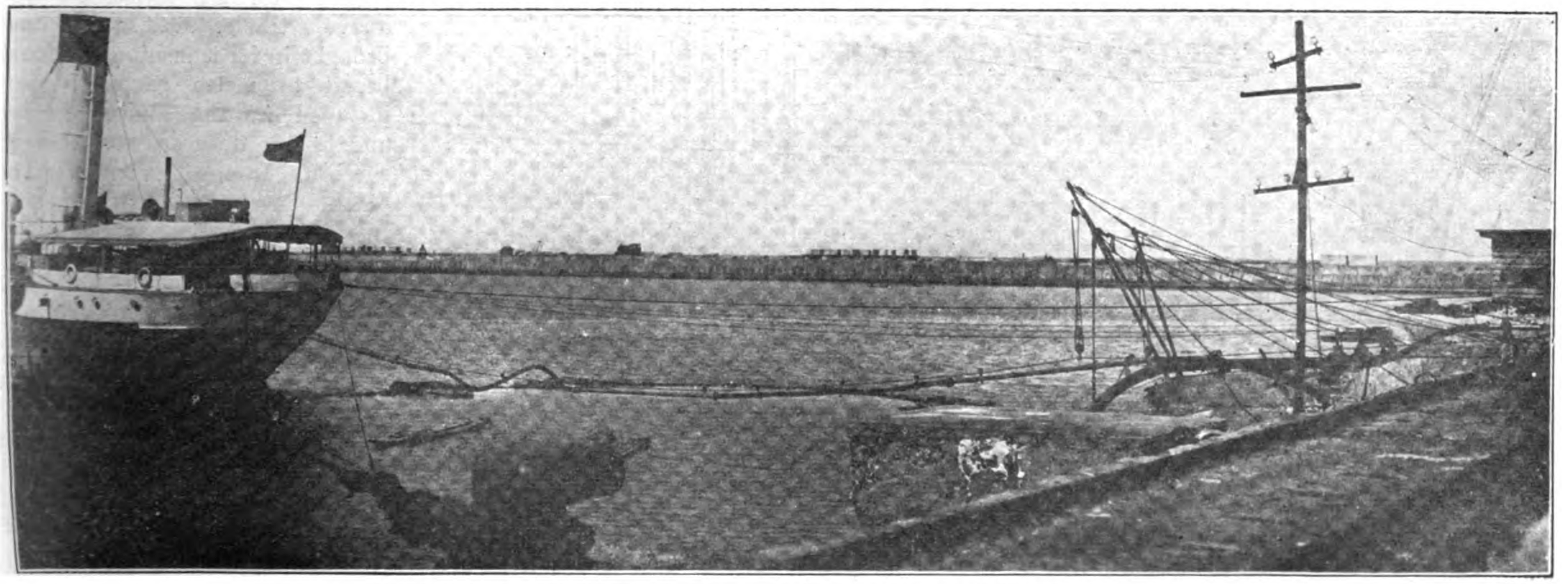


Tata Iron and Steel Works: Bar Mill

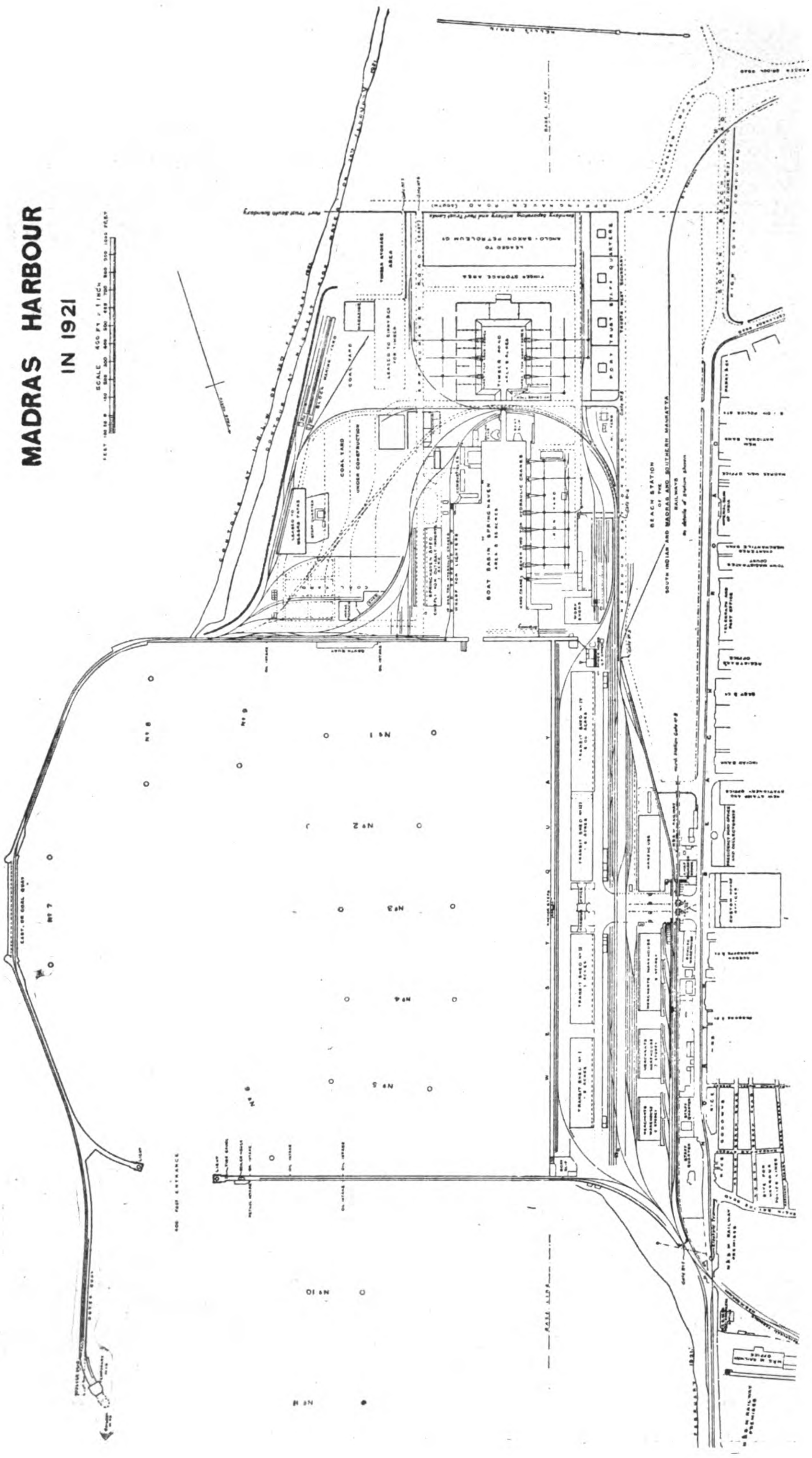
University, assisted by a staff of Indian wiremen and electricians." The coke-oven department is also under the sole charge of an Indian. Social welfare work among the employees is actively undertaken at Jamshedpur, which is a well-laid out town possessing a modern water supply and sanitation system, hospitals, schools and recreation grounds.

The Madras Harbor Works

IN the July 1921 issue of THE FAR EASTERN REVIEW there appeared a résumé of the administration report for the official year 1919/20. The 1920/21 report made by the chairman of the board of trustees, Mr. H. H. G. Mitchell, O.B.E., M.INST.C.E., M.I.E. (Ind.), says that in the past year the tonnage of goods handled and their value fell very little short of what they were in 1919-20, the record year. As was anticipated, there was a very marked revival in the foreign import trade, the value of which was 21½ crores of rupees against 10¾ crores in 1919-20, but this gain was counterbalanced by a drop of nearly 10 crores in foreign exports. There was also a drop of nearly two crores in the coasting trade, chiefly due to the falling off in the imports of food-grains from Burma. The sea-borne tonnage of goods handled amounted to 810,159 tons against 818,993 tons in 1919-20. The value of the private trade of the port, excluding government transactions and movements of treasure, amounted to 35½ crores of rupees against 36½ crores in 1919-20; it represented over 50 per cent.



MADRAS HARBOR—View of Suspended Steam Pipe and Floating Oil Pipe



of the trade of the whole presidency.

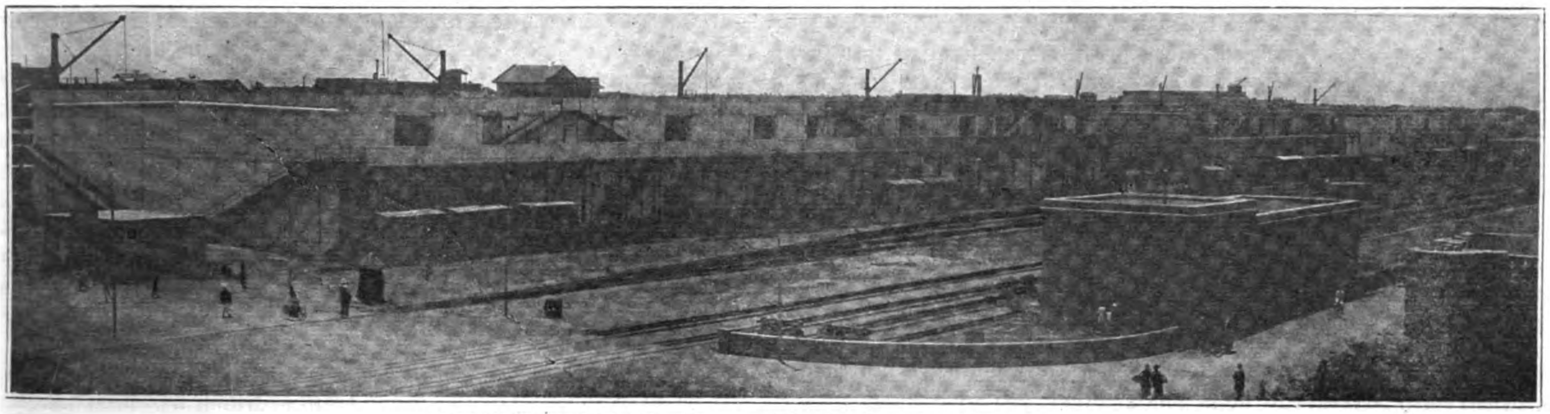
During the year 648 vessels with an aggregate tonnage of 1,662,444 tons, including 351 from foreign ports, 171 from coast ports and 103 country sailing craft, called at the port against last year's figure of 521 vessels of 1,166,352 tons. Several new lines made Madras a port of call, notably those trading direct with America. The vessel of the greatest tonnage which entered the port was s.s. *Khyber* of Liverpool of 9,014 tons and 5,685 tons net register, and the vessel with the deepest draft was s.s. *Morvada* drawing 29-ft. 6-in. Passengers to the number of 72,720 arrived at and 83,801 left the port making a total of 156,521. Out of 545 steamers that used the port 293 used the quays for landing cargo, passengers, horses, etc., 34 used the north and south oil berths for discharging oil, 5 used the outside berths for landing explosives and combustibles and 9 anchored in the fair way.

Tonnage Handled.—The total tonnage of goods which passed through the port in 1920-21 amounted to 848,756 against 940,564 in 1919-20, imports contributing 717,740 tons and exports 131,016 tons against 781,263 and 159,301 tons respectively in 1919-20. Of the above total, 810,159 tons was sea-borne against 818,993 tons 1919-20.

The difference between the total traffic and the amount sea-borne consists almost entirely of rail-borne coal brought in for bunkers and coal for transhipment from broad to metre gauge, harbor dues are levied on the above traffic. Railway coal brought in for transhipment from broad to metre gauge is not included in the above figures and harbor dues are not levied thereon. In the last six months of the year the import of coal by rail has practically ceased.

Engineering.

Cyclone Damage Works.—During the year the steel caisson, weighing 240 tons, filled with concrete, forming the head of the rebuilt portion of the sheltering arm, was sunk. The first 25-ft. of steel work, weighing 142 tons, was erected on the Port Trust slipway and launched in June. The erection of the remaining 30-ft. was carried out afloat,

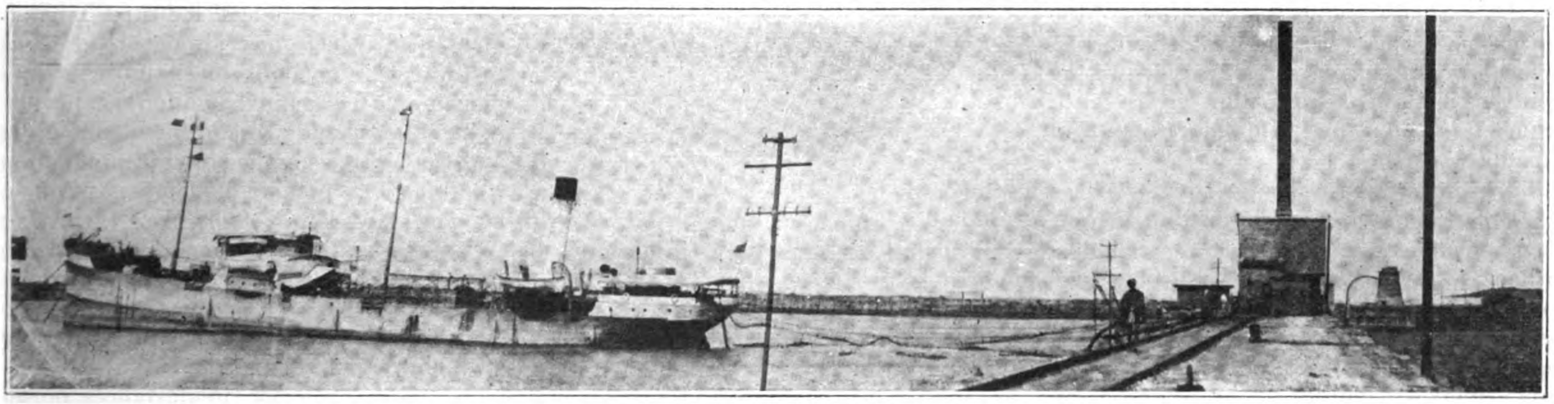


MADRAS HARBOR—Range of Newly Completed Warehouse

and completed by the end of September by which time, with the addition of 530 tons of concrete, she was drawing 26-ft. The finished caisson was then flooded and kept on the bottom, in the north-east corner of the harbor, during the November cyclone season. In January, she was refloated and towed out under lee of the sheltering arm where a further 610 tons of concrete were filled into her. This load brought her draft down to 36.5-ft.

Early in February 1921 she was placed in position in 40-ft. of water. Three days later unexpected bad weather set in and she started to move and worked herself into the bottom. After all attempts to steady her had failed, she was finally floated out to save her from being lost altogether. Additional freeboard was provided by adding two extra 4-ft. strakes and the sea bed at the site was hardened with broken stone and levelled off. Five weeks later, on 12th March, 1921, a second attempt to place her in position was made and proved successful. The remainder of the concrete filling was then put in, and by the end of March, 4,048 tons had been deposited in her. Five slices of block work measuring 30-ft. had to be put in temporarily in advance of the semi-permanent head to enable the Titan crane to plumb the well of the caisson for grabbing. These slices will be taken out and rebedded after the caisson has been sunk to her final level.

Cement.—Eight hundred and forty-eight tons of cement were purchased during the year. Of this quantity, 500 tons were obtained from England and the balance was bought locally, 250 tons being of local manufacture. 1,136 tons were used. The stock at the end of the year was 748 tons.



MADRAS HARBOR—Vessel Discharging with Steam Supplied from a Boiler on the Groyne

Engineering Works in Ceylon

THE first steam-roller manufactured in Ceylon has been at work for six months. Colombo government factory, where it was made, has now undertaken the construction of six similar machines. Their cost is about half of that of the imported article, and they suit local conditions better. The only portions not made locally are the cast steel gearing and cylinder lubricators.

During the war a 3-ton steam wagon was made at the Colombo government factory. It has been at work for four years transporting road metal for the public works department in the Negombo district. The government has now authorized the building of two similar steam wagons. In this case also the cost, compared with that of the imported article, is very low.

A wind-mill made at the Colombo government factory last year is now at work pumping about 80,000 gallons of brine every 20 hours to the crystallizing tanks of the Elephant Pass government salt works.

Three steam-driven saw mills at the government factory saw about 600 tons of timber per annum for wagon building and other purposes. The sawdust feeds a 150 h.p. power plant made entirely at the government factory, and saves some Rs. 8,000 per annum.

At the government factory about 30 steam-rollers of different types are overhauled every year.

The machine-shops for handing bridge-work are equipped very fully with modern tools. Parts of a bridge with a span of 175-ft. are now being produced. The annual output of finished material from the workshops, principally for the public works department, totals about 2,600 tons.

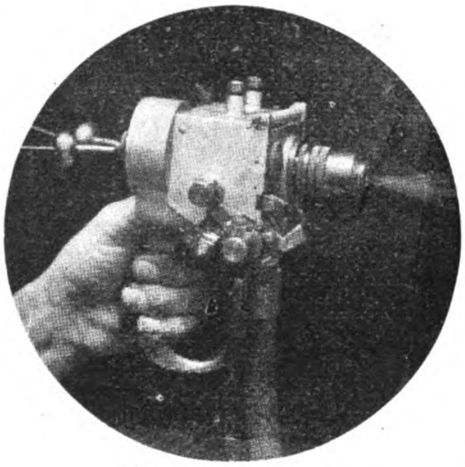
There are only a few engineering establishments at Colombo dealing with ship and motor repairs. Prospects in the engineering trade in Ceylon, considering the steadily-growing local and Indian demands, are considered good.

Schoop's Metal Spray Process

A Valuable Invention

MR. SCHOOP of Zurich, Switzerland, was watching his children with a Flobert rifle when he chanced to note that the bullets striking a wall were crushed thereon, producing a strongly adhering lead coating. This led him to make some experiments with small shot, which brought out the fact that the grains of lead on being crushed form a partially homogenous layer, provided their surface is cleansed and free from any trace of graphite. This observation led, through a number of more or less successful stages, to the processes which have now been technically developed to a high degree of perfection.

The apparatus consists of a vessel containing the metallic powder, or which the lower part can be closed by an ingeniously constructed valve with an irregular seating surface. Compressed gas, after being heated in a special heating device, is passed through the pipe into the upper part of the apparatus in order to force the powder out under pressure; the greater part of the gas from the same source, after having a rotary motion impared to it, acts on the powder expelled from the vessel and hurls it with great force through a nozzle and a metal tube on to the object to be coated.



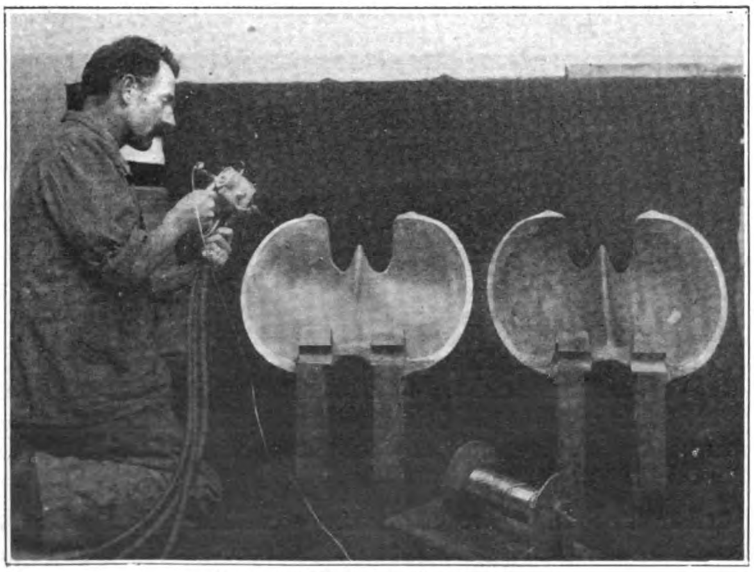
Schoop's Metal Sprayer

Before passing on to the consideration of the various practical applications of the invention, it may be said that the microscopical sections made show how closely the sprayed metal adhers to the surface on to which it is projected, and how it eats and fills up its smallest pores.

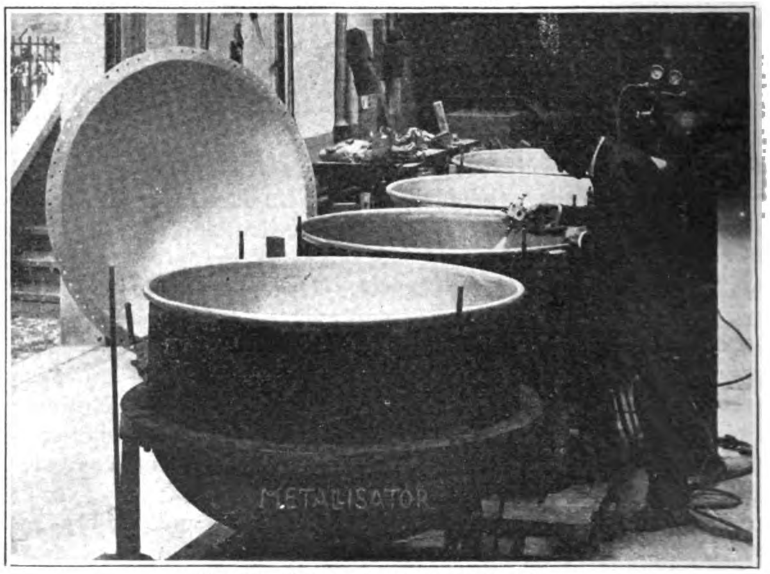
This coating is always equally dense and homogenous and can be made adherent or removable according to the preliminary treatment of the surface to be coated. The list which is given here of the uses for which the spraying process has already been employed, or in which it may possibly be used, cannot in any way claim to be complete, but is only intended to provide examples of the commercial possibilities of the process.

The first possibility is the application of the spraying process for coating objects with lead or zinc or the plating of the interior of vessels, vats, etc., for use in the chemical industry, in mines and many other works. Any vessel of partially any material or any part of an apparatus, which is difficult to get at, can be protected against rust. The process is of particular advantage where angular irregular bodies are concerned, and especially in eases where it is desired to cover large surfaces of finished constructional parts as a protection against rust.

It is of interest to recall the trouble which has been taken to obtain successful protection against rust in the cases of high structures which are exposed to the action of the weather, such as iron pridges, and the fact that of late years many bridges lave been built of armored concrete largely owing to the enormous exbenditure which the constant renewal of the paint of the iron bridges necessitated. If the finished parts of structural iron work are properly sprayed, there should be no further expense beyond the one initial outlay for a considerable time. There is ample opportunity of observing on many railways how very much such structures suffer under the action of the weather, in spite of the most careful painting. Again, in many railway stations, the iron structures are greatly damaged by smoke. The value of spraying process in this direction can be recognized at once. Before leaving the consideration of the heavier engineering branches one branch of technical industry must be mentioned which has always stood alone, for whilst in modern times processes and machines are daily invented for the purpose of facilitating and accelerating manufacture, and thus increasing the power of production, we find that in the electro-deposition of metals, the laws of nature themselves place insurmountable obstacles and the importance which the spraying process has in this connection is obvious. Theory teaches us that by galvanic means we can deposit with a current of 1 ampere not quite 1.2 gr. of copper in an hour. If the current density per sq. decimeter exceeds more than 0.3 to 0.5 amperes at the most the copper deposit becomes under ordinary circumstances porous or spongy. It is not, therefore, practical to deposit by ordinary methods more then about half a gr. of copper per hour, which forms a coating of 0.02 millimeter thickness. Of late years a

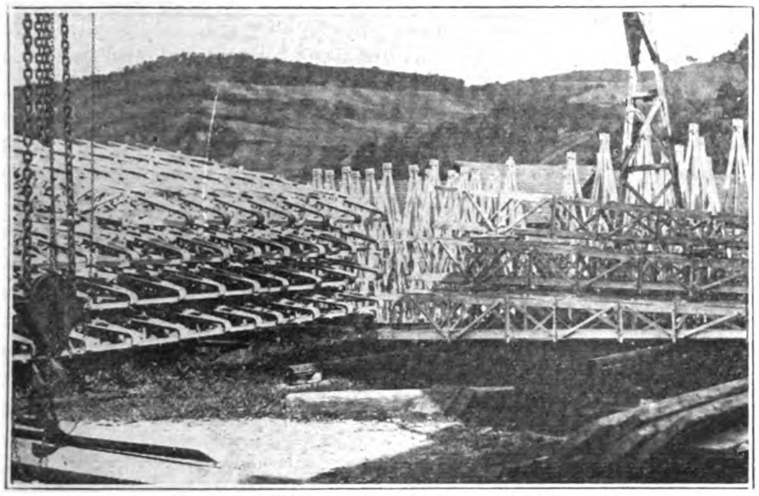


Spraying Water Turbine Blades



Coating Confectionery Boiling Vats.

firm has invented a rapid copper plating bath (which permits a deposition of about 40 gr. of copper per hour). However such cases are exceptional, for copper is the most suitable metal in the electroplating industry, whilst in the case of other metals all the most ingenious devices have not advanced far beyond the above

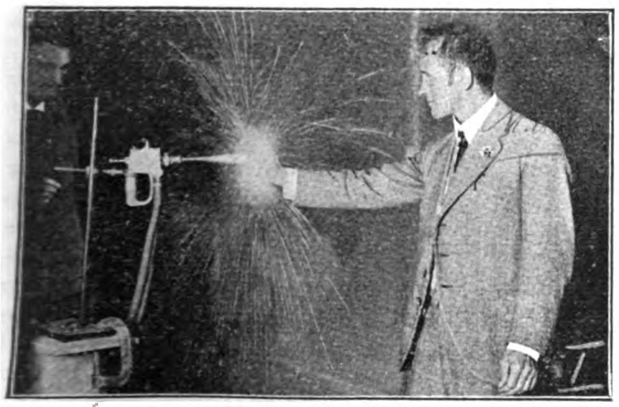


Transmission Towers and Spreaders for the Swiss Electric Railways Galvanized by the Schoop Process to Prevent Rusting

mentioned limited means. Further a deposit of even 40 gr. of metal per hour per sq. decimeter cannot be compared with the operation of the spraying process, which can deposit this quantity in a fraction of a minute, the deposition taking place with the same precision and the same close adherence of the metal to the smallest hollows and irregularities as is the case with electric deposition.

Metallic surfaces only need cleaning with a sand blast before spraying, and objects which do not conduct electricity do not require to be first rendered conductive since the sprayed coating can be produced on any material. In addition to this, the process offers the great advantage that it permits us to work the one metal which the art of electric deposition has up till now been unable in spite of all efforts to utilize : aluminium.

The possibilities of applications of the process for industrial purpose are, of course, quite unlimited, especially since the temperature of the metal spray is very low, so that not only combustible materials, such as wood and paper, but also substances which are actually highly inflammable, such as celluloid, and even explosives, can be directly sprayed. The coating of fabrics with metal for airships, thus rendering them more gas tight whilst not appreciably increasing their weight by the thin metallic coating (which may be of aluminium), may provee of just as much importance as the coating of wooden frames and fabrics of aeroplanes for their protection against the weather and for increasing their stability. As a matter of fact, the coating of wood with metal is in itself virgin soil, and has many possibilities which are obvious. For example, the coating of ship bottoms and other ship parts and of telegraph poles and masts for protection against weather and insects.



The Inventor: Shoop

Packing cases, etc., can easily be strengthened by spraying the edges of the boxes for oversea transport. The task of soldering up a box containing dynamite must be a very unpleasant one, but it can be affected without danger by spraying process.

After what has been said it is unnecessary to reiterate the advantages which the applications of the spraying process offer in connection with artistic industrial works, for instance, coating wood, plaster, leather or celluloid objects wholly or partially with metal, or for producing patterns on surfaces by means of stencils. With regard to the taking of impressions of parts to the body, it may be mentioned that in Paris a successful attempt has been made to obtain finger-prints of criminals by the spraying process. Finally, in connection with this group of removable coatings, there is one branch in which the spraying processes are of the greatest importance, namely, the manufacture of casting and blocks. The spraying processes offer a most valuable substitue for all these methods since they are equal to them in accuracy and are superior to them in rapidity. For instance, it is possible to prepare in one hour from one single negative block as many as thirty finished blocks which are equal in every respect to electro-types. It is also possible to make blocks of iron and even of steel; formerly these could only be produced by means of highly complicated engraving processes on a steel plate.

In all probability the Schoop spraying processes will constitute a great advance in not a few branches of technical industry and amongst these branches are some for which it will create an entirely new history.

Railway Construction in China and Japan

JAPAN ORDERS RAILS.—An order for 13,000 tons of rails has been given an American corporation by the railway department. Although different according to year, the annual consumption of rails by the government railways is 55,000 tons on average, of which the larger portion is supplied by the government Iron Works, whose yearly capacity is about 40,000 tons of rails minus supplies to private railways. The railway department found, however, the limited supply by the iron works inadequate for its needs this fiscal year, which have been increased somewhat over usual requirements. This compelled it to give the above order to the American firm on December 26, including 60 and 75-lbs. rails for arrival at Otaru, Yokohama and Kobe until March 31. The contract prices are kept sceret, but are conjectured by some to be in the neighborhood of Y.110 per ton, which is Y.10 or 15 lower than the Japanese products, which are stated, further, to be inferior in quality.

LIGHT RAILWAY, ANHWEI.—The Woo Shun Coal Mining Company at Pei-lee-ching in Shih-hsien, Anhwei, will build a light railway from the mines to Ma-dao-ching, a distance of 25 *li*.

CHUKIANG-HSIENTU RAILWAY, HUPEH.—The building of a railway from Chu-kiang to Hsientu, western Hupeh, is projected by the local gentry to develop the rich mines in these districts.

BRIDGES OVER YANGTZE RIVER.—Dr. Waddell has recommended to the Peking government the construction of three large bridges at an estimated cost of $70,000.000 :—(1) The Han-kiang bridge over the Han-kiang connecting Hankow with Hanyang; (2) the Yangtze bridge over the Yangtze River connecting Wuchang with Hankow; (3) the Yangtze bridge over the Yangtze River connecting Nanking with Pukow.

The Sugar Industry of the Fiji Islands

The Problem of Indian Labor

By Thos. J. McMahon, F.R.G.S.

COMPARED with other island groups of the South Pacific, the Fiji islands have a claim to a wide and wonderful development. While there is much credit to be given to the skilful, business-like management of enterprises, and the splendid energies of the white settlers, the fact is very clear that the administration has been and is encouraging development. Undoubtedly a sane balance has been maintained by the administration in assisting trade and development, while fully protecting the interests of the native people.

Traveling through the group it is most impressive to see the vast areas under sugar cane, the number, size and modern equipment of sugar mills, the hundreds of miles of excellent light railways, the great solid steel bridges spanning the wide rivers, and Fiji has mighty rivers on its two big islands of Viti-levu, and Vanua-levu—the variety of motor traffic on harbors, rivers and roads, and the thousands of people in employment. To find a city of the size, and business importance of Suva, the capital is in itself a fine indication of progress. That picturesque city with its well-paved streets, avenued with splendid shade trees, with its liberal electric lighting, its ample water supply, and its long stretch of habor wharves, that can be considered as the best of the Southern Pacific territories. This city is at once the grandest evidence of the energies and enterprise of the settlers, the progressiveness of the administration. It would be impossible not to be especially impressed with the extent of settlement on every hand, and in all the bigger islands. Though the settlements of Indians, introduced to the islands 48 years ago are both mean and unpicturesque in appearance. The coast lines of the whole of the island territory is one unbroken chain of plantations, sugar, coconut, sisal, bananas, and other tropical products. There are on the rivers, and running to the hills great stretches of pastoral and dairying lands that cannot be excelled in quality even in Australia, or New Zealand. Indeed, summed up Fiji can be characterised as a land where marvellous things have been accomplished, a land which can be pronounced as one of magnificent fertility, and remarkable and varied resources.

Fiji consists of 250 islands, 90 of which are inhabited, with a total area of 7,500 square miles. The group lies in the tropics 176 east and 178 west longitude, and 15 and 20 degrees latitude. The two big islands Viti-levu and Vanua-levu, have exceedingly lofty ranges of mountains, and these have a most important bearing on the rainfall, which is heavy and frequent in the wet areas of the group, as well as saving from long continued drought the dry areas, there being about equal divisions termed wet and dry areas. The mountains too influence the climate of the islands, which is very moderate, and healthy, the death-rate of Fiji being the lowest in the wide world. White men and women 70 to 90 years of age are to be met in the islands, many of whom have lived there for 50 years and over.

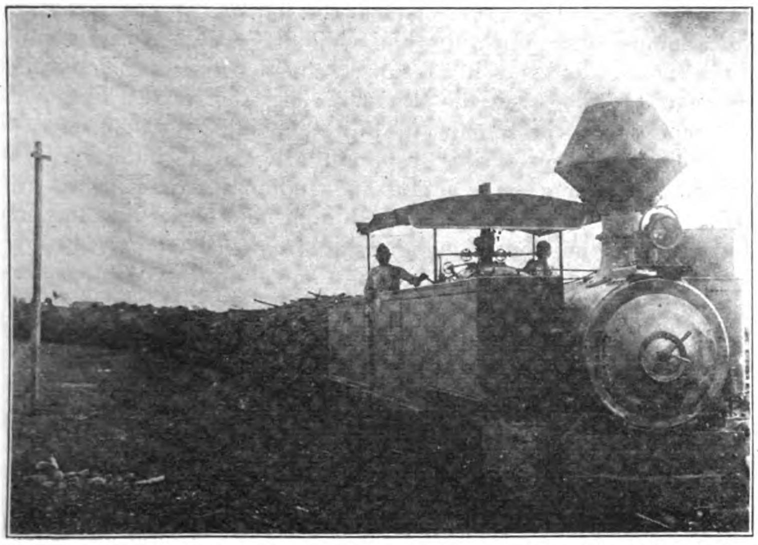
The populations of the group are 4,000 whites, 85,000 natives, 61,000 Indians, 3,000 Chinese, and 3,500 half-castes.

The trade of Fiji is now equal to 16 million (or 4½ million British money) dollars a year, but given an era of progress, unhampered by industrial unrest, and then a wide extension of development, the trade of the group should easily be in ten years equal to 100 million dollars a year. An important detail in the future prosperity of Fiji is the influence of the Panama Canal, this now gives Fiji a very definite central position in the South Pacific. Further there is the possibility of a federation of all British administered islands of the South Seas, with Fiji as the governing centre, should this eventuate and it is very likely within the next year or two, then Suva will become one of the three most important shipping centres of the Southern Hemisphere, Sydney, Australia and Auckland, New Zealand the others. There is the fact that the island's trade once altogether Australian, is now quickly drifting to Suva.

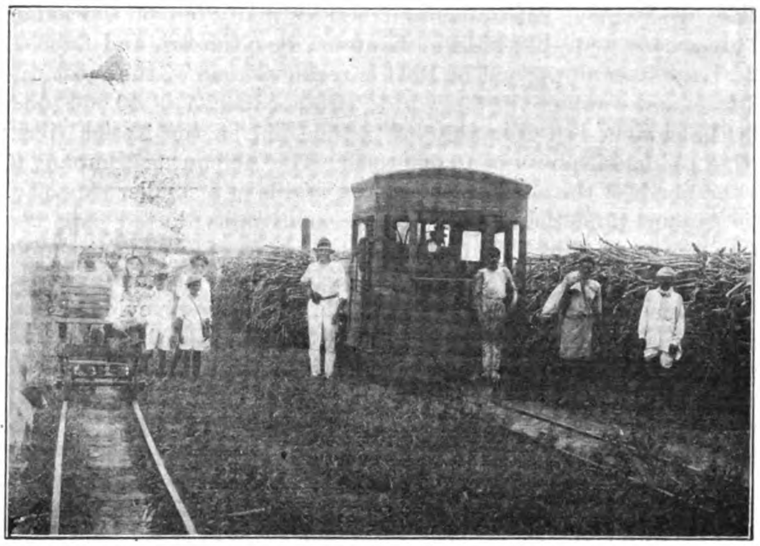
The Colonial Sugar Company's "Lautoka" Mill in the Fiji Islands

As a commercial asset the sugar industry of Fiji is worth many millions sterling. The group has sugar lands that compare most favorably with the best of all other sugar countries. In an estimate computed some years ago and taken from an old sugar journal, it stated that some countries produced five tons of sugar to the acre, and Fiji but three. Out of the 150 thousands of acres cultivated in Fiji to-day 85 per cent. of the acres can under experienced cultivation offer from four to five tons. Fiji lands too have up to date shown an extraordinary fertility, and vigor, and beyond the cane ash from the mills no other fertilizer is used. Fiji is recognized as one of the most valuable territories under the British crown, and on account of its wonderful sugar industry possibilities. The amount of sugar exported from Fiji in 1921 was less than other years on account of strikes by the Indian workers, nevertheless, it ran up to figures nearing 80,000 tons. Having comfortable labor conditions—the seasons can be depended upon the output of sugar this year should be about 100,000 tons, in another decade with reasonable conditions and a wider sugar cane area the supply should reach 200,000 tons.

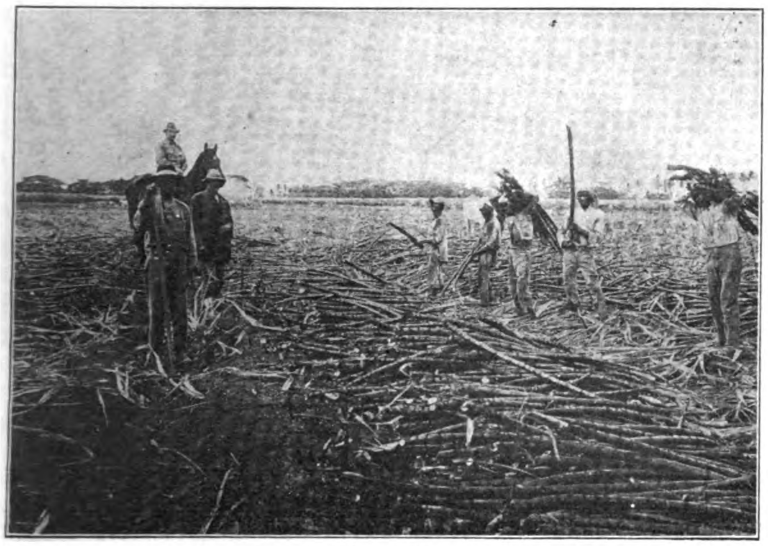
Sugar companies in Fiji have shown both courage and enterprise. There are some three companies, the Colonial Sugar Company, the Vancouver-Fiji Company, and the Melbourne Trust



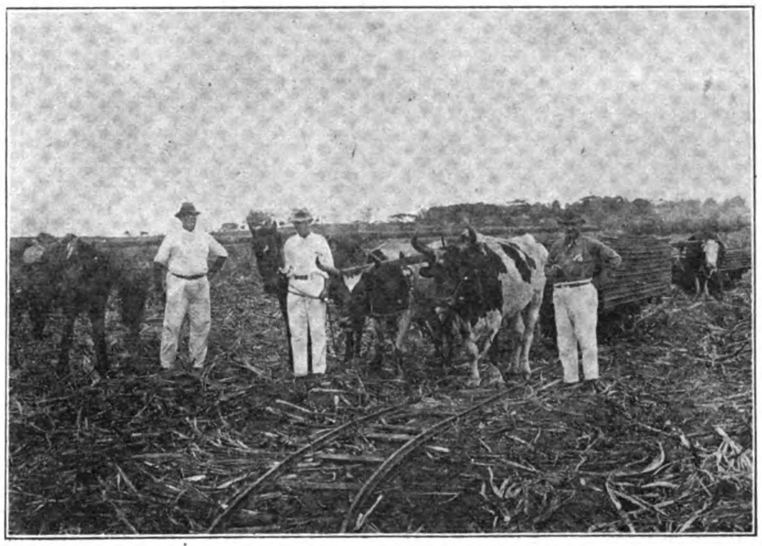
Sugar Cane Train on the Lautoka Plantation, Fiji. The Colonial Sugar Company operates over 200 miles of plantation railways in Fiji



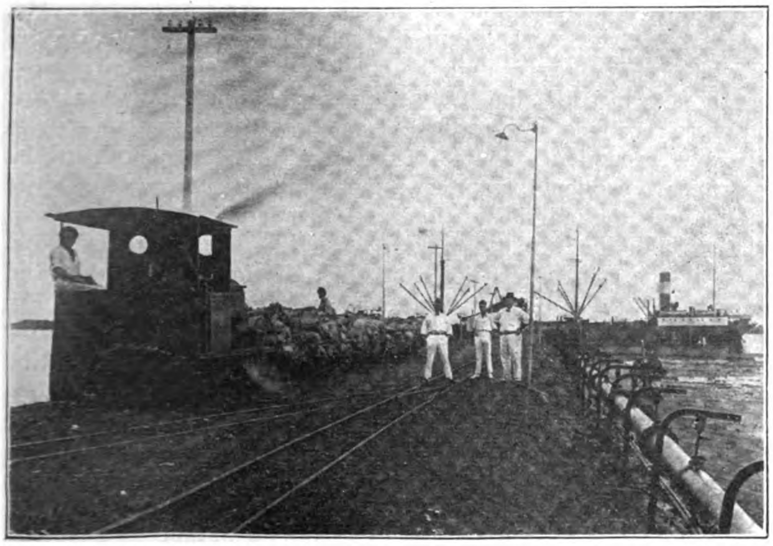
In the yard of the Vancouver-Fiji Sugar Company's Mill on the Navua River, Fiji



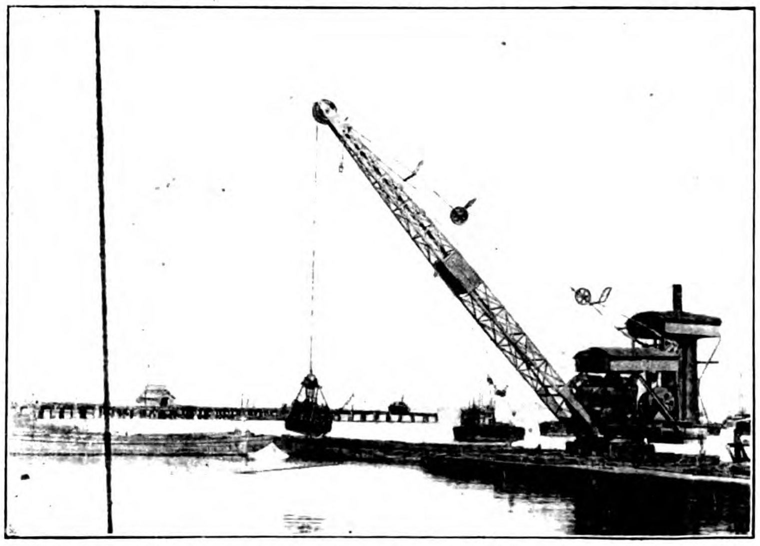
Collecting Burnt Cane, Uandi District, Fiji



Laying Portable Tracks into the Cane Fields, Fiji



The Wharf of the Lautoka Mill, Fiji, showing Molasses Pipes and a 7,000 tanker being loaded with Molasses

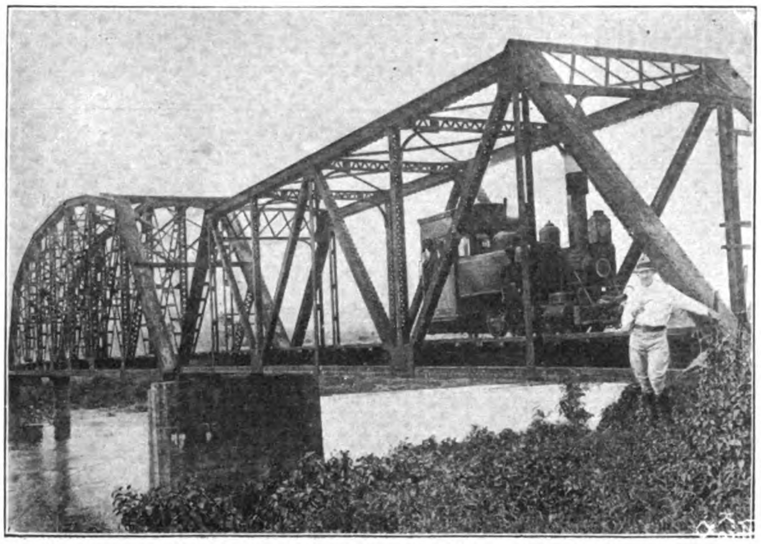


Reclamation Work in Suva Harbor, Fiji. All the foreshore is being reclamed for building sites

Company. The Colonial Company is a giant concern with its head offices in Sydney, Australia, and besides many ten of thousands of sugar cane acres has mills at Lautoka, Ba, Nausori, and Labasa. The Lautoka mill opened in 1903 is reckoned one of the most up-to-date, and complete in the world, with a capacity of 40,000 tons. The Vancouver-Fiji Company has a fine mill on the Navua river, with a producing power of 10,000 tons. The Melbourne Company is on the north of the island of Viti-levu, and is of a smaller capacity.

At one time there were several small mills dotted over the sugar areas, but present-day experience is for big capacity mills serving large areas, and fed by railways. The fluctuating price of sugar in the markets of the world makes it very evident that in order to attain success manufacturing of sugar must be conducted on large scale, large mills and large areas, small mills, and small areas these days cannot be made profitable.

While all companies may claim capable organization, the Colonial Sugar Company stands out as a master organization, it is one of the surest foundations for the continuance of progress in Fiji. From the smallest beginnings it has spread itself out a vast enterprise employing thousands of people, white, and black, and expending millions of money in outlay in mills, lands, and the settlements of its employees. It has a fine record of able management, of successful business, and above all of fair and liberal treatment of its workers. But in this last essential no company has received more unfair treatment from its Indian workers than the Colonial Sugar Company. No company has been more active in helping the Indians. Recently it placed at the disposal of the Fiji administration a sum equal to 400,000 dollars, to be applied in helping Indian planters of cane. This company like all others has given generously to promote happiness, and contentment among the Indians, in aiding the erection of schools, temples, and all Indian institutions. The question of labor then is the difficulty before the sugar companies, and it is the problem they are now considering. The labor is mostly Indian, and the problem is in their unrest and unappeasable discontent.



Bridge over the Navua River for the Plantation Railway of the Vancouver-Fiji Sugar Co.

Wives of Indian laborers employed by the Fiji Sugar Companies. Women and children wear necklaces of 25 to 50 gold Sovereigns

Some particulars of the Indians in Fiji will be informative and interesting. Forty-eight years ago they were introduced to the group, to help the whiteman's enterprises, then mainly cotton. They left India where starvation was their wretched lot in life, and they came to Fiji where opportunity for success beckoned the enterprising man on every side. When some years later the Colonial Sugar Company began its efforts, and the sugar industry was getting a firm footing, thousands of Indians came to Fiji under terms of indenture, terms that must have been agreeable to them, and which were not challenged by the Indian government of the day. The indenture system had faults of that there is no doubt but no reliable records show that the system conduced to callous treatment, or even harshness of the Indians employed. And there is the substantial proof of this that for over 30 years the Indians worked contentedly. There is also the indisputable fact that the Fiji administration faithfully and vigilantly watched the interests of the Indians, and that it was not possible to oppress them. Some ten years ago, however, the British empire was startled by reports that represented the Indians in Fiji as little better than slaves to the whiteman's enterprises, especially the sugar industry. The Indian government took action and Indian immigration to Fiji, which strange to say, maintained high numbers, was abruptly stopped. Commissions of enquiry were frequently employed studying the conditions of the Indians, and one and all gave satisfactory reports, all being unanimous in the opinion, "that under no circumstances could the Indians have been better off in India." The reports have now long since been amply proved as the insane imaginings of Mr. Ghandi and his party. An English missionary of the name of Andrews, and a man who have lived in India for many years, visited Fiji and reported the condition of the Indians as most favorable. A second time he visited Fiji, and then to the amazement of all pronounced the indenture system as the worst form of slavery, and the standard of the morals of the Indians arising out of the callousness of the system to be lower than the poultry yard.

Mr. Andrews directed his charges mainly against the Colonial Sugar Company as the biggest employer of Indian labor. Andrews charges immediately brought the administration and the white settlers to an united action and the result was the charges were shown to be pure exaggerations, founded in pique, Andrews not having any official authority for his investigation did not receive the facilities and reception he thought he was entitled to. He, however, received much hospitality and kindness especially from the white sugar planters and the officials of the sugar companies. The Indians by this time fully appreciating the knowledge that they were receiving a great deal of sympathy, and that unrest in India was becoming a source of anxiety to the British imperial government, suddenly assumed a menacing attitude to the white settlers and the administration and demanded racial equality, and the fullest political priveleges. Agitators arrived from India, mostly in the guise of religion, and their efforts were so quick and successful that before they were found out, the Indians of Fiji were rebellious, they were deliberately aiming for the overthrow of British rule, and the ousting of the whiteman. Strikes lasting for months were used to block and destroy the whiteman's enterprises. Failing in this to the extent they hoped for they broke out in riots notable for bitterness and savagery. Then firm administrative action was taken, troops were brought from a British dominion, and Indian ambitions for supremacy in Fiji were ended. indentore system was abolished, and representation was given the Indians in the Fiji general parliament. But these palliatives had not the effects expected. The morals of the Indians remained

as low as ever, crimes with them were as frequent as ever, and these conditions remain though the indenture system has ceased for over two years. All wage and living conditions in enterprises were improved with them in the hope they would be satisfied. But they remain sullen, they demand racial equality, all political privileges, and the sugar workers ask for 2 shillings an hour, equal to 16 to 18 shillings a day's work. In their sullenness they decided no matter what happened they would as a matter of religion call a strike to last six months. With fanatic perseverance they carried out the strike, the sugar industry suffered a set-back, but the Indians are at the moment realizing they have made a terrible mistake. The sugar industry is employing hundreds of Fijian natives in their place who are proving willing and capable. Then there is afoot an agitation to repatriate the Indians and get there reliable Chinese in their place. The sugar companies too are showing an independence the Indians little expected. One sugar company has given notice its mill will close until the high price of cane demanded by Indian planters is reduced, and the wages asked by Indian workers are brought within those reasonable limits leaving some margin of profit for the company. All other sugar companies threaten to follow suit, and the Indians are confronted with the proposition of being repatriated to India, back to starvation and misery. What will be the result one is not at present able to foretell, but this is very evident that if Chinese labor can be brought to Fiji, it will mean a new era of prosperity for the group. The majority of the white settlers will be glad to see the end of the Indians, whose unreasonableness is beyond all comprehension.

What is so remarkable in all this turmoil is the prosperity of the Indians. The following details will be enlightening as showing how well the Indians have done in Fiji. Some of the richest men of Fiji are Indians, some sprang from the ranks of the indentured labor. Every Indian settlement of Fiji is notable for its ever-increasing population, these settlements are crowded with children. There are 12,000 individual Indian land-owners in Fiji, owning 125,000 of the richest acres, and valued at £750,000. An interesting evidence of the wealth of the average Indian in Fiji is demonstrated in the jewelery worn by the women and children, and sometimes by men. It is quite a common thing to see gold and silver ornaments to the value of 400 dollars or more on a woman. Tiny children playing in the gutters sport necklaces of gold sovereigns, Australian currency. Every family owns its land, its cow, its horse and sulky. There are many motor cars in Fiji, and majority are Indian-owned. In five vessels leaving Fiji for India, between the end of 1920 and the beginning of 1921, there traveled 4,751 adults, and 1,960 children, mostly born in Fiji, having remittances equal to £196,389, jewelery equal to £31,891, and cash in hand £8,054. These are the people who going to India proclaim the territory a land of slavery. And yet these are the first, the moment they are robbed of their wealth, a frequent occurrence in India, friendless and penniless, they cry out to be sent back to Fiji.

What is one of the most remarkable admissions of the untruthfulness of reports of ill-treatment of Indians in Fiji is the fact that the Indian government has since last October permitted immigration to Fiji, and to-day the Indians are flocking to the group.

For the moment the future of Fiji is obscured in the problem of the Indians, but nothing is more assured that given reasonable conditions of labor, Fiji will soon be one of the most important commercial territories of the Southern Hemisphere. The factor that guarantees this prosperity is the continuance of the sugar industry.

Nantungchow Automobile Service

SINCE new motor roads has been completed in the various villages of Nantungchow, a company has been established to operate motor services.

CHANGSHA-NINGSHANG AUTOMOBILE ROAD.—Messrs. Tao Chung-chien and Liu Keh-chia have obtained sanction from the provincial government of Hunan to organize a company with a capital of $500,000 to build an automobile road from Changsha to Ningshang and operate autobus service there. Some Americans have proposed to construct a road starting from Changsha, passing through Yih-yang, An-hua, Sao-poo and Tze-kiang, thence to Hsiang-dan via Wu-kong, Pao-ching and Hsiang-hsuan and leading to the newly-built military road in Hunan, with a total length of 2,661 *li*, with "famine" labor. The work will cost $2,000,000, of which $1,200,000 will be appropriated by the Chinese and foreign famine relief committee and the balance raised from other sources. A number of Americans in Peking have supported the proposal and the U. S. minister is said to have approved the scheme.

AUTOBUS SERVICES IN SHANSI.—Up to the present, four automobile roads recently built in Shansi have been opened to traffic under the jurisdiction of the provincial road administrations, viz., the Taiyuanfu-Tanhsien line, in the north, the Taiyuanfu-Lingshih line in the south, the Taiyuanfu-Fenyang line in the west and the Taiyuanfu-Pingting line in the east. The Tsing Yih Autobus Service Company, Ltd., is being organized at Taiyuanfu, Shansi, by Mr. Sung Hai-hsu to operate an automobile service on the South Shansi road with six freight and four passenger cars. The Tsing Pei Autobus Service Company, Ltd., Taiyuen, Shansi, is raising capital in Fengyang for purchasing cars to operate on the roads leading to western Shansi.

YUNNAN-KWANGSI AUTOMOBILE TRANSPORTATION COMPANY.—The Yunnan-Kwangsi Automobile Transportation Company, Ltd., is being organized at Yunnanfu with a capital of $5,000,000 in 500,000 shares of $10 each. The motor road to be built by the proposed company is to start from Quan-yang, Yunnan, passing through Yu-chee, Kiang-chuen, Tung-hai, Kien-sui and Koo-ju, connecting with the Kooju-Pichaoshan Railway, thence to Pan-suh, Kwangsi, via Wen-shan, Kwangnan and Po-yih. Three branch roads have been mapped out leading to Zih-wu, Shih-ping and Wen-shan respectively.

ANKING-LIUAN AUTOMOBILE ROAD.—An automobile road is to be built from Anking, Anhwei, to Liu-an, Anhwei, viâ Dung-cheng and Wai-ning by Messrs. Wang Li-yuan, Sha Hsiang-chang and Wang Shaio-shan in order to operate an autobus service. The actual work will be started in about two months when the capital is expected to be subscribed.

ROAD CONSTRUCTION, SOUTHERN KIANGSI.—It is reported that Mr. Chow Wei-kong, chairman of the road construction bureau of Kiangsi, has secured a loan of $3,000,000 from a foreign firm in Shanghai to construct the projected roads in southern Kiangsi.

Industrial Notes

MATCH FACTORY, KIRIN.—A match factory is to be established at Tungkwan, Kirin, by Mr. Sun, manager of the Hun Man Flour Mill.

MUKDEN COTTON MILL.—The Mukden Cotton Spinning and Weaving Factory promoted by General Chang Tso-lin is inviting tenders for the erection of a new factory building.

FLOUR MILL, SHONG-CHIU, HONAN.—A flour mill to be capitalized at $240,000, is being organized at Shong-chiu, Honan, by Mr. Liu Sze-kiu, manager of the Hun Foong Coal Company.

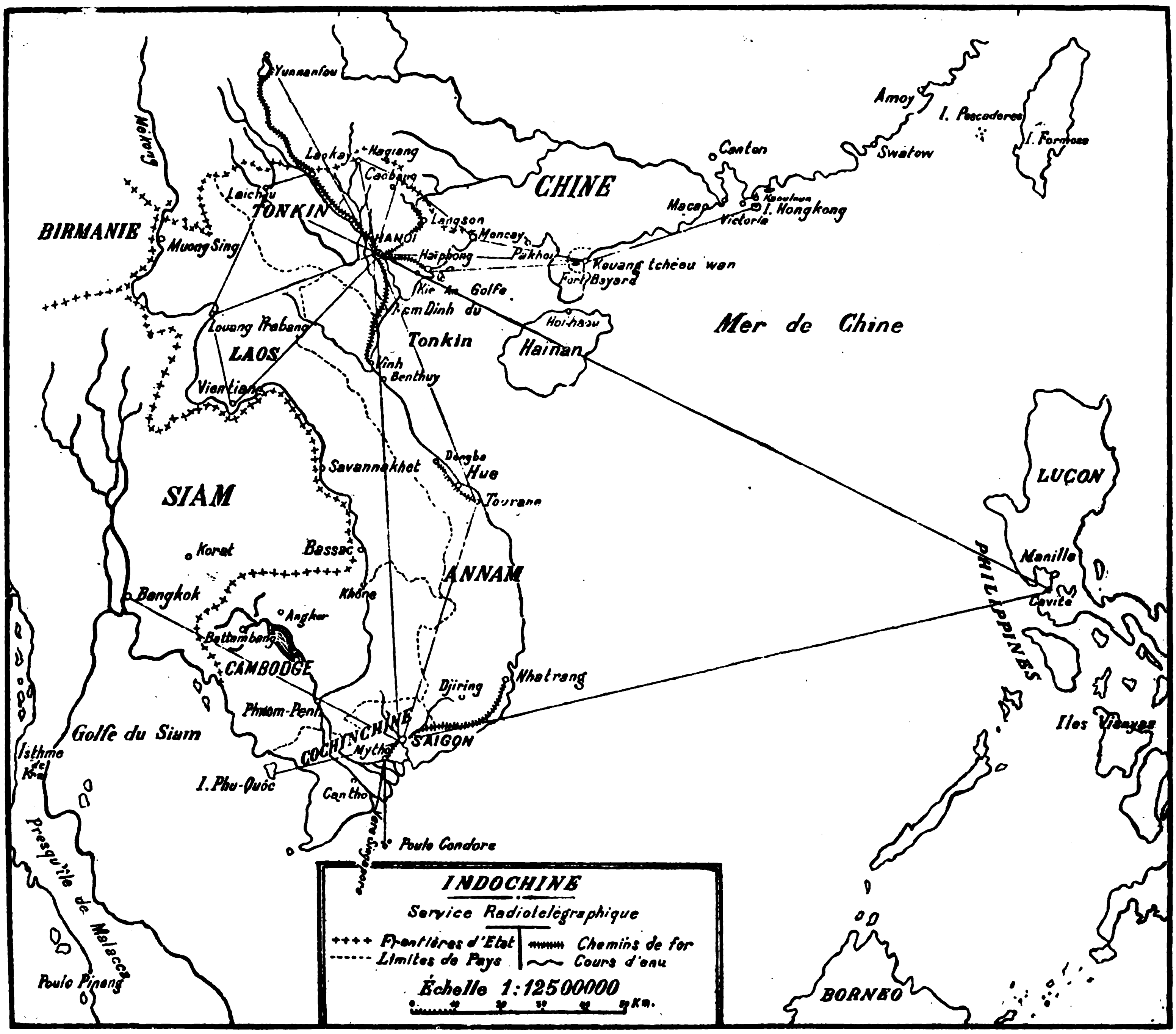
ICE PLANT, CHUNGKING.—The Woo Foo Ice Manufacturing Company is being promoted at Chungking, Szechuan.

FLOUR MILL, PAOTAO.—The Pao Foong Flour Mill is being organized at Paotao by ex-premier Chien Nun-hsiung and several others.

CANTON BUILDINGS.—The Canton authorities are contemplating the sale of the lot of land at Tung-kong-sing-hu for $700,000. Of this, $300,000 will be spent in erecting a magnificent town hall and a library, $200,000 for offices for the various departments and bureaus, $100,000 for a school, and $100,000 on a hospital.

GLASS FACTORY, NANCHANG.—A glass manufacturing company to be capitalized at $400,000 is being organized by Messrs. Li Shiao-chou and Wang Cheng-chien at Fu-kien, Kiangsi.

The Radio System of Indo-China



(L'Eveil Economique de Indo-Chine)

THE radio telegraphic system of Indo-China inaugurated under the administration of M. Sarraut and developed by his successor, Governor-General Long, consists of 15 stations, including the two at Cat-Ba and Kien-An, which are also equipped with special apparatus to facilitate navigation during heavy fogs at the entrance to the Haiphong River. The general system is divided into three secondary systems: (a) Tonkin system; (b) Laos system; Cochin-China system.

The Tonkin system comprises the following stations:—Hanoi, Kian-An, Cat-Ba, Moncay, Caobang, Hagiang and Laichau. From Kian-An or Moncay, communication is had with Fort Bayard at Kwangchow-wan, which is in communication with Hongkong. Moncay, Caobang, Hagiang and Laichou, all frontier posts, intercommunicate and connect with Hanoi and are able to give immediate notice of the movements of the pirate bands which infest the coasts or the bandits which flit back and forth over the Kwangsi border. Upon the coast station at Kian-An, in addition to its connection with Fort Bayard and ships at sea, devolves the duty of transmitting the standard time.

The Hanoi station of 25 kilowatts capacity is equipped with the best high-powered apparatus and communicates with Yunnanfu, Tourane, the Laos stations, and Saigon, and is to be enlarged for a rapid public service with Saigon. The coast station at Tourane is maintained for communication with vessels and to transmit the meteorological bulletins.

The Laos system has stations at Luang-Prabang and Vientianne which intercommunicate and connect with Hanoi. The Cochin-China system comprises the stations at Saigon, Mytho, Phuquoc and Poulo Condor. The Phu-tho station at Saigon which as yet is only a secondary station, but which is to be equipped as a first-class station within the year, now communicates with Hanoi and other countries through the station at Bangkok in Siam and through the Manila station with San Francisco. The Mytho coast station is in communication with ships and with Singapore and transmits the Havas News telegrams and the meteorological bulletins twice daily. A permanent service has been assured since July of last year between the three coast stations of Mytho, Tourane and Fort Bayard. Indo-China receives every night from the Bordeaux Central Wireless Station in France full market and exchange reports and the news of the day.

The Far Eastern Review

A Monthly Review of Far Eastern Trade, Finance and Engineering, Dedicated to the Industrial Development and advancement of Trade in Far Eastern Countries

ENGINEERING FINANCE COMMERCE

5 JINKEE ROAD, SHANGHAI CHINA

Telegraphic Address: Farview, Shanghai

SHANGHAI, MARCH, 1922.

Reaping the Whirlwind

ONCE again it devolves upon the responsible authorities of Shanghai to invite attention to dangers which menace the vital interests of the port. It will be recalled that in his last annual report on the trade of Shanghai, the commissioner of customs gave as a reason for the recent business panic the great influx of foreign firms during the preceding year whose inexperience and plunging precipitated the calamity. This, in turn, was due in large part to the irresponsible campaign carried on by over zealous "griffins" who rode into local popularity on the wave of anti-Japanese sentiment and capitalized this to the full in their agitation to induce new firms in the United States to open offices in Shanghai. In this cockpit of conflicting national interests, it is difficult at times for newspapers and other defenders of the public welfare to speak as plainly as they might had they only one national interest to cater to. Shanghai paid, and paid dearly for a propaganda that would never have been tolerated in a united community.

In the same manner as the ground was prepared for the last catastrophe so the way is now being prepared for a greater one through the irresponsible and reckless propaganda of bolshevists, student politicians and the activities of foreign organizers and sympathyzers. In the December number of THE FAR EASTERN REVIEW we reprinted extracts from a recent report of the U.S. department of labor on "Labor Unrest in China," which invited attention to the "precariousness of a situation aggravated by bolshevist propaganda."

"Sporadically, radical doctrine had crept into university lectures; but its penetration into Chinese industries was not definitely manifested until the ninth anniversary of the Chinese republic, October 10, 1920, when the bolshevik agents in Shanghai issued circulars informing their Chinese comrades: (1) That the Peking government, being in the hands of the capitalists, was oppressive to the masses; (2) that in bolshevism the workers would find the only object worth living for and (3) that the people of Russia had already achieved this object after three years' vigorous struggle. Quietly and steadily this force has been gaining a foothold in the rank and file of labor. In February 1921 the Chinese chargé d'affaires in Denmark, who was then well informed on the Russian situation, advised Peking of the broadcast propaganda of the Moscow society in Tientsin, Shanghai, Hankow and Canton. A few weeks later Peking residents were startled by motor cars flying a red flag with a star and the letters F.E.R. (Far Eastern Republic). Thereafter the Chinese government felt it necessary to take precautions against lectures on communism and *pseudo* welfare speeches delivered at mining camps and industrial centres ostensibly for the benefit of the workers."

The business man, however, sees nothing and cares less about matters which does not affect his immediate prospects or profits. Under his very nose an agitation has been skilfully carried on under the cloak of Chinese patriotic uplift in some form or other, now as a protest against the proceedings of the peace conference at Paris, now as a national boycott against Japanese goods over the Shantung award, again as a protest against the Anglo-Japanese alliance and the menace of a boycott against British goods if the pact was renewed, in manifestations against the proceedings of the Washington conference, in the seamen's strike at Hongkong with its communistic tendencies and the perturbed labor conditions in Shanghai, with the possibility of further disorders arising from dissatisfaction over the results of the Pacific conference. It is all part of a set plan, the attempt to create a super-government in China, thats in the end will overturn the existing regimé and bring the agitator, into power.

When these agitators or their mouthpieces assume to stand for organized public opinion in China. the business man takes it all for granted. The foreign merchant in fact, the world at large, would be surprised to learn that the telegrams ostensibly emanating from Shanghai menacing the peace delegation at Paris and signed by at least a hundred chambers of commerce, guilds, student bodies and peace societies, were written in Peking and mailed to Shanghai to be there placed on the cable in order that the Shanghai date line would give weight and verisimilitude to the formidable array of signatory senders.

We recall one of these cablegrams which made a most profound impression upon the Chinese delegates in Paris and on the delegates and journalists of other nations to whom its contents were disclosed. It read:

Loutsenghsiang, Kooweichun, Wuchaochu, Wangchengting, Chinese Delegation, Paris.

"People of China rising to true representation through their merchants associations, students federations, guilds and organizations of all classes of citizens, have voiced entire nation's disapproval of transfer of Germany's former rights in Shantung to Japan. Signature of peace treaty without reserved understanding that subsequent questions of Germany's former rights or of Japan's succession to such rights in Shantung will be decided according to principles of international law and equity, will not be recognized as binding upon Chinese people. If such reservation is not formally acknowledged by other powers, treaty must not be signed. Any action contrary to these instructions will force people to repudiate delegations signature as unrepresentative and to hold delegation and government responsible for inevitable loss of national rights. Resignation of delegates at this time will be considered as evasion of responsibility." Signed by United Chambers of Commerce, 38 Students' Federations, 25 Educational Associations, 23 Christian Societies, 4 Returned-Student's Unions, Bankers, Silk, Tea, Linen and Laborers' Guilds, 3 Peace Societies.

Is it any wonder that in face of such a telegram that the Chinese delegates to the Paris conference refused to sign the peace treaty without reservations, or that they were so long a time returning to China? Is it any wonder that the American delegates and others who were permitted to read these instructions were impressed with the growth of public opinion in China and feared to go contrary to it?

The success of this experiment in creating a super-government through the medium of the press and the free use of the cable, convinced its authors how easy it would be to repeat it whenever the occasion required, and we find the same tactics resorted in the summer of last year by holding out the menace of a boycott against British goods if the alliance with Japan was renewed. Telegrams bearing the signatures of chambers of commerce, students' associations and other Chinese bodies were dispatched broadcast to members of parliament, the British cabinet and to prominent personages and bodies in America, all carrying the veiled threat of what would happen unless the demands of China were complied with. It also went over. It was anti-Japanese, therefore popular.

It was all so easy. The success attending the first attempt to wield the weapon of a manufactured public opinion resulted in its revival in order to prevent the renewal of the Anglo-Japanese alliance. Telegrams signed by eighteen guilds and students bodies were dispatched to the British parliament and cabinet protesting against the alliance and conveying the threat that unless China's demands were complied with, a boycott would be declared against British goods. It was the same old trick, employed in the same old way, by the same minds that engineered the anti-Japanese campaign at the time of the Paris conference.

Unchecked, unhampered, emboldened by success, the system of intimidation spread. The Hindoos learned well the lesson taught them by the passive resistance of the Chinese, and unless all reports that come to us are exaggerated, the British have paid the price in India for the example set in China. They have paid

the price in Hongkong, and unless signs fail, we may dance to the tune of the red piper in Shanghai unless a saner view is taken of these recurrent political agitations.

Is the picture overdrawn ? Read the following extracts from the report of the police commissioner of Shanghai and draw conclusions :—

"The spirit of unrest, or of self-expression, noticeable during recent years continued during 1921. Various movements were in evidence ; among them being the opposition to the licensing of rice shops in July, different agitations by street unions, objection to the raising of rents, meetings in connection with China's cause at the Washington conference, Chinese representation on the municipal council, activities of socialist extremists and strikes. Other matters of special public interest to which the police are giving attention include the new produce and stock exchanges and light weight copper coins.

"The reaction on the Chinese people brought about by disappointed hopes was seen in May 1919 when the decision concerning Shantung at the world peace conference led to a general strike in Shanghai, which lasted for three days, and was only settled through the central government dismissing three of its most prominent officials. Bearing in mind the serious consequence which the reaction produced for the central government on that occasion, propagandists of certain interested politicians have for some months past been filling the Chinese minds with accounts of the great things to be expected from the Washington conference.

"A danger exists that the people, forgetful of what transpired in the past, will once again permit themselves to be gulled by the activity of these propagandists. As early as last August these parties began the distribution of leaflets advocating the abolition of extraterritoriality. This propaganda was followed by meetings of local bodies at which resolutions dealing with various phases of China's alleged wrongs and desires were passed and telegraphed broadcast. The most recent meeting, at which about 6,000 people were present, took place on a piece of vacant ground near the Shanghai-Hangchow Railway Station on December 8 when it was suggested that telegrams be sent to the Chinese delegates demanding the cancellation of the twenty-one demands and the unconditional return to China of Tsingtao and other rights and concessions in Shantung. These proposals, however, were not put forward, as strong opposition was raised by a prominent member of the Hupeh reconstruction society, and the chairman of the national organizations union of China, who pressed for the inclusion of a demand for the non-recognition of the Peking delegates. The same resolutions, including this demand, were, however, brought up and passed at a second meeting held by some forty-five persons behind closed doors in the premises of the national Chinese students' union, and the telegrams were dispatched. Following upon this the entire student body and other societies announced their disapproval of the attempt to prejudice the position of the Peking delegates and have since emphasized their opposition by resigning from the national citizens diplomatic federation, the organization which had taken the lead in sending off the wires.

"The audiences at the several meetings held up to the end of the year in connection with the Washington conference consisted for the most part of youths, professional agitators and idlers. It would not be correct to assume that the resolutions passed at these meetings at any time represent the opinions of the Chinese people. In China, however, where the masses to a great extent are swayed by the few, this agitation may produce quite unexpected and dangerous results. It may revive (among the masses) that never extinct spark of anti-foreign feeling and cause an uncontrollable conflagration which will be fed by the usually untruthful and biassed propaganda which has been scattered broadcast by disgruntled politicians and others."

The police commissioner has given voice to a truth that no foreign newspaper in China or foreign press correspondent cared to dwell upon. "*It would not be correct to assume that the resolutions passed at these meetings at any time represent the opinions of the Chinese people.*" He then points the danger, the menace that has been growing under our nose for over two years. The police commissioner gives official corroboration to evidence that has been in our possession for a long time. The warning of the police commissioner will fall on deaf ears. There are too many national interests catering to the Chinese who tremble and fear for the good-will of the guilds and other bodies whose names are so freely employed to give prestige to the agitators and their work. Any movement masquerading under the cloak of Chinese patriotism or uplift is safe from foreign condemnation or criticism.

The police commissioner of Shanghai is not an alarmist. The picture he paints is not unreal. The Chinese have been trained and led by foreigners in their manifestations against Japan and Great Britain. They have been encouraged to boycott Japanese goods, while highly placed foreigners have publicly advised their countrymen to hurry and skim the cream off the Chinese trade. They have been educated to strike, demonstrate, hold meetings, send out menacing telegrams to foreign governments and black-jack their official delegates into accepting their viewspoint under penalty of having their ancestral tombs desecrated. They have been taught to attack the foreigner in his vulnerable point, his pocket-book. The example has spread to India, to Hongkong.

The agitators have mobilized and manufactured Chinese public opinion through pressure on chambers of commerce, students associations and other bodies, and held the rod over foreign governments and conventions. Yet at no time have they faithfully represented the great mass of Chinese.

We have been solemnly told that Bolshevism could gain no foothold in China, that the peaceful, democratic, docile Chinese would reject the teachings of Lenin; anti-Japanese writers have frothed at the mouth in denouncing the unwillingness of Japan to evacuate Manchuria and Eastern Siberia because of her fear that the red terror would find its way into China and Korea. Well, the picture is before us. The strike at Hongkong bears all the earmarks of a communistic plot. The police commissioner of Shanghai whose business it is to ascertain the inside facts surrounding disturbances in the settlement, has spoken.

The police commissioner is right. The agitators and the propagandists have pulled the wool over the eyes of the foreign community in China and through their foreign press connections, have fooled the entire world. They have educated the Chinese proletariat, the masses of unthinking, easily-led workers, into dangerous ways. Having learned their lesson, we look may forward to the inevitable consequences. As we sow, so shall we reap.

The Craft Guilds of China

By Ta Chen, U.S. Gov't Department of Labor Report

THOUGH the labor union, being an importation from the West, is yet limited in scope and influence, the craft guild penetrates every important trade in the country. A correct understanding of this powerful organization may therefore be a long step toward comprehending the industrial background of modernized China.

Two instances will give in a nutshell the tremendous power of the guild organization, past and present. In 1883, a dispute about tea export at Hankow (Hupeh) became acute. The foreign traders accused the Chinese merchants of showing false samples. The Chinese made the countercharge that false weights had been used. Whereupon the foreigners decided to stop buying, and the Chinese accepted the challenge by stopping sales. The tea markets in London rose steadily, but no tea could be bought at Hankow, and no coolie would work for the foreign concerns. A strike had been declared by the guild, which both the merchants and the coolies obeyed most strictly. Consequently, the foreign traders lost an enormous amount of money in the export trade.

Though it has undergone material changes, as shown elsewhere in this paper, the guild of to-day is no less powerful. The salt merchants of the Yangtze valley, including the provinces of Anhuei, Kiangsi, Hupeh and Hunan, were in the past required to deposit money with the bureau of salt producing and transporting merchants. Instead of immediately paying the money to the producers, the bureau usually retained it indefinitely and deposited it in banks of questionable financial soundness to draw interest, thus causing great inconvenience both to the merchants and producers. After repeated protests, the bureau was abolished and a new one established in its place. On hearing of a proposed revival of the old bureau last August, the guild of the salt merchants immediately threatened a strike, which, had it not been prevented, would have cut off the salt supply of the whole Yangtze valley for some time.

Organization.—The craft guild varies with various trades and different cities. For brevity's sake, the tea guild of Hangchow (Chekiang) is here taken as a type. The manager is elected annually. With him are slso elected 12 committeemen, all of whom serve without pay. Each of the committeemen takes charge of the guild for one month, thus keeping the chairmanship in rotation. The executive secretary is the only paid officer in the organization. Finding that the rotation system, though basically democratic,

has worked to increase irresponsibility and division of powers, the tendency to-day is toward the concentration of executive control in a committee of three, to be responsible for the work of the guild the year round. In some guilds the number of salaried officers is also increased.

Any firm wishing to join the guild must pay an initiation fee of a certain sum, that of the Hangchow tea guild being $300. The member firm is then required to obey the regulations of the guild, some of which follow: (1) That no member firm is allowed to accept from or give to customers any rate other than the guild rate; (2) that no member firm is allowed, through underhand dealings, to cause loss to a fellow member firm and (3) that no member firm is allowed to antedate or postdate drafts. For any violation of these important rules, the firm is fined. In the case of defamatory acts of a more serious nature, a general meeting of all the guild members is called, and the guilty firm is, by vote, expelled from the organization.

Membership.—The firm is a corporate member of the guild. For ordinary guild meetings, each firm sends its representatives. The firm is composed of masters, journeymen and apprentices. The masters and journeymen are members of the guild, whose vote is required in such important matters as a common boycott. Though early initiation is possible, the apprentice becomes a member only after he has served his term of apprenticeship. The young craftsman is then a journeyman, and in that capacity he stays for two or three years. Professional courtesy and loyalty to his master impel him to serve first his master, with regular pay, before offering his services to others.

The masters and journeymen usually work in perfect harmony. Should there be friction, the journeymen hold meetings at a Chinese tea house and then make representations to the masters. As they are very helpful in the trade, their complaints receive careful consideration and are usually settled to their satisfaction.

More by custom than by guild laws, girls are prohibited from learning a trade. In the Bankers' Guild of Wuhu, this limitation is explicitly stipulated in the regulations. The only place where the girls are preferred is the needlemakers' guild. This is apparently due to women's aptitude for needle-eye drilling, an art requiring much precision and patience. To-day, however, girls have more trade opportunities, as shown by the fact that 56,000 woman employees practically monopolize the work of the silk-reeling industry in Shanghai.

Authority.—The craft guild is the unifying and controlling agency of a particular trade. Its word is law. It standardizes weights and measures. Keeping close watch of market changes, it issues a rate, usually daily, which must be accepted by all the members and the buying public. Rate-fixing power is given to the guild primarily to eliminate cut-throat competition by the members. When the guild system works normally, underbidding and underselling are not common, unless done in an underhanded way. Small merchants are not put out of business by unfair competition on the part of the more influential ones in the trade. The industry is thus stabilized.

Disputes arising between members are usually first referred to the guild for settlement, when the manager and the committee sit as judges, with two or three experts as advisers. In the early days, the failure to appeal first to the guild might result in the revocation of judicial protection to the member: "It is agreed that members having disputes about money matters and other important matters shall submit their case to arbitration at a guild meeting, where every effort will be made to arrive at a satisfactory settlement of the dispute. If it is impossible to arrive at an understanding, appeal may be made to the civil authorities, but if the complainant resorts to the court in the first instance without referring to the guild, he shall be publicly reprimanded, and in any future case he may bring to the guild, he will not be entitled to redress." To-day no such rigidity exists. The contestants are given the option of choosing between the court and the guild for the first appeal for settlement of any dispute. This change has come about mainly through the extension of governmental functions. In the past the government of China seemed to assume the *laissez-faire* attitude toward commerce and industry. After paying the taxes, the merchants were left entirely free. For the protection of their own interests, the guild undertook to formulate laws to regulate trade. In time, custom and tradition grew, and the craftsmen voluntarily submitted themselves to the jurisdiction of the guild. Of late, the state has promulgated trade acts and mining laws, and has employed experts to adjudicate industrial suits. Nowadays, the court as well as the guild may be appealed to as the tribunal of the first instance. But, owing to the craftsman's inability to pay the lawyer's fees and his aversion to legal technicalities, the guild is often preferred.

Income and expenditure.—The income of the craft guild comes from five main sources: (1) The initiation fee paid by the member firm at the time of joining the guild, as shown in the case of the Hangchow tea guild. (2) Donations by wealthy members. Twenty-five per cent. of the reserve fund of $850,000 is from private endowments. (3) Fines. The bankers' guild of Wuhu requires each member firm to deposit 100 taels as a guaranty fund against fines for violations of the guild rules by that firm. (4) Commission fee paid by firms from sales. The timber guild of Ningpo assesses its members according to the amount of their sales, averaging one-tenth of 1 per cent. on the turnover. (5) Fees from masters and journeymen. The Han Yang guild at Ichang provides that workmen, such as tailors' or carpenters' hands, pay 30 cash (about 13 cents gold) per month; their masters, if keeping no account books, are also assessed at the rate the guild sees fit; and clerks pay 2 per cent. per annum on their incomes.

Broadly stated, the income from the first three sources is for the permanent maintenance of the guild, and the income from the last two is for its current expenses. Other important items of the guild's expenditure cover the following: (1) The guild gives financial aid to sick members, and also to those who are temporarily unemployed. (2) The guild gives charity to the families of the poorer members. (3) The guild holds religious or social festivals several times a year. (4) The guild pays a government tax.

As above stated, the most important activities of the craft guild are threefold, relating to (1) the trade in general, (2) the member firms and (3) the masters, journeymen and apprentices. To illustrate its workings, the bristle guild of Shanghai is selected as an example. The bristle export of China for the year 1917 amounted to 64,181 piculs and 6,171,638 Haikwan taels. One of its largest member firms employs a manager, who receives a monthly salary of $100, an assistant manager who receives half that much, a chief foreman, who receives $30, and a number of foremen, who receive $20 each. The workers are paid by piecework, and are on a contract basis. They average about 35 to 50 cents a day. Twelve hours constitutes their workday.

The organization of this guild is one of the most up-to-date, and its regulations, of which the following are the main provisions, are typical:—

Both long and short bristle, if prepared by the ordinary method, shall be sold at the guild rate and no other. Bristles specially prepared or imported from other cities shall be sold at special rates to be fixed by the guild committee and the agent of the firm.

No member firm is allowed to accept from or give to customers any rate other than the guild rate.

Every master must, before commencing his work, purchase a certificate from the guild for $5. Masters from other cities, if in financial difficulties, may work for a month before purchasing the certificate.

Each master is allowed to take not more than one apprentice at any one time. After the completion of apprenticeship, the apprentice must work for the master as journeyman for at least two years before he himself takes in any apprentice.

The master shall be paid once in every 10 days. Fifteen cents are taken from every dollar to defray the current expenses of the guild.

There shall be a uniform system of weight, and that of the guild shall be adopted.

Drinking and gambling are prohibited.

All disputes arising between workers and employers shall be submitted to the guild for settlement. There shall be no strike pending a settlement.

The Craft Guild's Influence on Chinese Indutries

The honesty of the Chinese in business dealings has become proverbial among Americans. In a large measure, business honesty is developed in the guild organization. " One price " for one grade of goods must be strictly observed by all the members. A free exchange of promises between the promisor and the promisee, for a consideration, is always binding on both parties. The craftsmen, by mutual agreement, strive to turn out faultless work. Equity prevails, efficiency is obtained, and industries prosper.

Large-scale combination has protected the craftsmen and the coolies from oppression by the landed aristocrats and political demagogues. As early as the T'ang Dynasty (618-906), heavy taxation and the impressed labor act forced the poor to leave their homes secretly in order to evade the taxes, and in doing so they permanently lost their small holdings. Toward the end of the House of Sung (960-1279), vargrancy was phenomenally increased. In late years, the floating population has been an exploited class of manual laborers and skilled workers. The guild has acted as their fraternal protector. Even to-day some guilds pay about one-third of the court fees for the member who institutes a law suit and has a good cause of action.

In no small degree the guild has saved Chinese trade and labor from being crushed by the powerful foreign merchant. Facing a common competitor, the tradesmen and the coolies stand firm. Protesting against a grievance, the laboring classes unhesitatingly follow the decision of the guild. The foreigner has succeeded in exploiting China only by the incessant influx of capital, and the natives have maintained their industries largely through organization.

But here praise must stop. The guild, as a unifier, has greatly hindered freedom of action, and prevented the making of " industrial captains." A man of perspicacity and shrewdness finds little expression for business initiative. He is confronted with two alternatives : He must either blindly follow the guild regulations, or suffer a common boycott for exercising his creative intelligence and violating rules.

There has never been a national guild, the boundaries of the province limiting its furthermost development. Interprovincial competition by guilds has caused tremendous waste in production and retarded the growth of industries on national lines. The rice-milling industry is a favorite battlefield of the " Kwantung gang " against the " Hupeh gang " for capital and labor. Regional bias is carried to the extreme, and closer co-operation rendered impracticable.

Conclusion

The old and new phases of industrial life in China have here been sketched. The craft guilds have been efficient protectors of the skilled and unskilled workers from economic exploitation by capitalists and politicians. China is emerging from handicraft, and to-day the labor union is gaining ground. During this transitional period, various socio-economic factors have aroused the workers to strive for their rightful place in the industrial life of the country. This is clearly seen in the present unrest.

Finance China's Highways

The Way to Assist the Automotive Interests

AUTOMOBILE manufacturers are more and more turning their attention to the development of Far Eastern markets where the building of new roads, opening up virgen territory to commerce, offers a vast field for the sale of trucks and passenger cars. The rapid expansion of the automotive industry during the war with an unprecedented prosperity and purchasing power amongst the working and middle classes, taxed the capacity of the manufacturers to the limit, with the result that plants were unduly enlarged and many new companies created. With the slump, the conditions of the automobile industry have gone from bad to worse, the demand falling off in America to half the production capacity. The American market has reached a point of saturation and foreign markets must be developed if American plants are to be maintained at their present high state of efficiency and production. Approximately two and a quarter million cars can be turned out yearly by American factories, and of the present output only about eight per cent. are being exported. These conditions have brought home forcibly to the American automotive interests and their government which derives a huge revenue in taxes from these sources, the necessity of increasing exports in order to bring production more nearly to normal.

At the request of the national automobile chamber of commerce, the department of commerce has sent Mr. William L. Irvine a special expert to the Orient to investigate and report on conditions in Japan, China, Philippines, Siam, Indo-China, Malay States and India. American manufacturers consider that the Oriental market is capable of much greater expansion, and are prepared to do everything within their power to accelerate this development.

It may be said that the expansion of Far Eastern markets for automotive products, as in all other parts of the world, will go hand in hand with the construction of good roads, and whatever can be done to encourage and facilitate this desired end, should be carefully studied. In Japan, the government and its leading financiers are already working out a national system of new roads to connect the ports with the manufacturing centres, and the various provincial and municipal governments are appropriating huge sums each year for their construction.

In all countries of the Far East, with the sole exception of China, the various governments are appropriating increasing sums yearly for the construction of new roads, and a constant and steady development is the result. China alone, the greatest market of all, lags behind, with an empty treasury and no definite plan. There may be many ways whereby the automotive markets of China can be developed without outside financial assistance, but we are of the opinion that if any great expansion is to be realized, it can come only through some redical modification in the policy of the consortium powers which will enable foreign financial markets to come to the assistance of China.

The consortium policy is primarily a railway policy. It could not have been otherwise, as its fundamental function was to eliminate spheres of influence and harmonize the conflicting interests of the powers as expressed through their railway contracts, concessions and rights, which delimited these spheres. If the future railways of China are to be profitable, road construction must go hand in hand with their development, and provision made for advancing funds for that purpose. Or, as we pointed out in our special Automotive Number, issued in January last, a special financial institution should be created that could work with and through the more reputable Chinese banks in providing funds for road building.

A glance through the Automotive Notes in this section, will disclose that the Chinese are doing their best to construct new roads and create markets for mechanical transportation, but this is not enough to meet the demands of the foreign automotive industries compelled to seek export business to save their plants from deteriorating. A highway loan to China of say $100,000,000 would build 20,000 miles of new roads, and provide a market of for automotive products which would soon exceed the original investment.

At the present rate of road construction in the Federated Malay States, Siam and Indo-China, it will not be long before it will be possible to motor over metalled roads from the Chinese frontier town of Langson to the extremity of the Malay peninsula and Singapore. With Hongkong pushing its roads towards Canton, and the governments of Kwangtung and Kwangsi taking an active interest in highway development, not many years will elapse before it will be possible to motor from Hongkong to Singapore.

As a matter of fact, there are only a few sections from Langson south that remain to be completed. The road work in Fukien, Chekiang and Kiangsu provinces which is proceeding as rapidly as local funds can be advanced for construction, will bring the coast road to Shanghai. It sounds like a far off dream, but construction is going ahead and the dream may become a reality before two or three years are passed.

Is it worth while to assist in this development ? If so, the automotive manufacturers not only of America but Europe should give serious attention to conditions in the Far East and exert influence upon their governments and financiers to find a way whereby financial assistance can be extended to China.

Trade Follows the Loan

ONCE in a blue moon, some hard-headed American business man comes to China and after listening to all the confidential rot poured into his ears about the monopolistic tendencies of the other powers which exclude Americans from the field, he forms his own conclusions from the facts. Such an observer was Mr. C. H. Chubbock, the vice-president of the McClintic-Marshall Company, one of the largest structural steel firms in the United States. In recounting his experiences to the Engineers' Club of Philadelphia, he gave his views upon the possibilities for American engineering business in China, and went on to give his opinion about the probabilities. He said : " But what are the probabilities ? The probabilities are that on account of the American banker an engineer going out from here can spend months, can work his head off, and when he gets through he will come away the most disgusted man that ever 'came down the road.' An engineer of the Peking-Hankow Railroad told me, 'We like the Americans. We would rather do business with them than with anyone else on the face of the earth. But the European nations, French, British, Belgian, German and Italian, all of them will accept our loans and you demand an irrevocable letter of credit.' China is in exactly the same position as the United States west of the Mississippi River fifty years ago. If our American bankers then had taken the same attitude towards the development of our western states as they take toward the development of China, our great western areas to-day would still be a howling wilderness. *Gentlemen, trade follows the loan.* And as you travel around the world—I do not care whether it is China. Australia, the Malay States, New Zealand or wherever it is—an American representing large business interests has that constantly thrust into his face. On the Yellow River bridge, the only bid that did not figure on payment in government bonds was the American; and that I know, because mine was the only American bid.

"Now, how are you going to overcome that difficulty. Gentlemen, I advise you to go out there and look over the entire field. I am heartily in favor of Mr. Steinmitz's idea of having American engineers go over there and study the situation, but until our banking system becomes international in scope, you cannot do anything except become intensely interested and mad clear through to the backbone.

"You will find many opportunities. But the trouble is we send men who are not men of imagination--they are not men of vision. We send lawyers. Now, lawyers are fine in their place. But you know perfectly well that when you want to design a building, you have to see the picture before there is anything else done. You have to see that first and see it on a piece of paper. You will have to support the vision. A lawyer will tell you what is the matter with it after it is all over, but not before. So much for China."

Sharp, brief and to the point. Mr. Chubbock as an engineer probably left China " mad clear through to the backbone." We sympathize with him.

Commercial Aviation

A UNIFORM law governing the use of airplanes is essential if commercial aviation is to be developed on a business basis, in the opinion of the National Bank of Commerce in New York. Such a law must be at least national in scope and should be international, the bank believes.

" The development in the United States has been along lines different from that in Europe," the bank says in discussing the subject in the November issue of its magazine, *Commerce Monthly*, " due partly to the fact that the public has not been familiarized with flying as were the populations of the belligerent European countries and partly to the absence of a definite government policy. Commercial transportation companies have received neither assistance nor encouragement and in consequence private enterprises of this nature have accomplished very little. On the other hand the government, in the army, navy and post office departments, has been active in experiments of great value to commercial aviation so that in the United States the one distinctive example of successful aerial transportation on a large scale is not strictly commercial, but is merely civil, as distinct from military aviation.

" At the present time the air mail, including its contract lines, is the only manifestation of commercial activity in the air on any considerable scale in the United States. It is estimated that there are about one hundred transportation companies in the United States, but regular operation of substantial commercial importance has scarcely begun.

" Commercial aviation is laboring under many difficulties. By far the greater part of the material in use is converted war material, built for extraordinary performance rather than economy. This material must in some way be worked off the market before new and better models can profitably be built. Traffic is light and variable and the uncertainty of its future volume and nature is a severe handicap. There are in addition many technical details, both in regard to material and organization, that appear to be of a minor character but frequently turn out to be important to economical operation. The greatest handicap by far to further development lies much deeper than present financial prospects of the industry. It is the continued lack of public confidence in the safety and reliability of air transportation.

" Since the armistice accidents have been increasing in number in some countries at a higher rate than the increase in flying. The most carefully compiled figures, those for British commercial aviation, show the death rate of passengers to have increased from 0.10 per thousand passengers carried in the six months ending March 31, 1920 to 0.22 in the six months ending September 30, 1920 and to 0.30 in the six months ending March 31, 1921. In the twenty-three months from May, 1919 to March, 1921, inclusive, twenty persons were killed and twenty-one injured in a total of forty-eight accidents or one accident for every 33,200 miles flown. In the United States the number of casualties, both in military and civil flying, has been alarming, although it is not possible to determine the accident rate as no official reports are required either of flights or accidents.

" The situation in the United States in this regard is very much worse than in most other countries, where government supervision of civilian flying is practised. The lack of official regulation of aviation, in some form, is the greatest detriment to increased safety in flying in the United States. The present situation in the United States is one of total absence of regulation, with the exception of a very few state laws and municipal ordinances. In most parts of the country there is nothing to prevent any pilot from operating any machine, without regard to his competency or its condition. It may well happen and often does happen that an irresponsible pilot will fly a machine unfit for use, with imminent danger to the life of himself, his passengers, and the safety of the community. In case of accident the entire aircraft industry suffers through the injury to its most vital asset, its reputation with the public.

"The operation of airplanes for other than transportation purposes would, if properly regulated and supervised, perform a valuable service to commercial aviation by familiarizing large numbers of people with the advantages of aerial transportation. A system of licensing by which the safety of such flying could be improved cannot be established, however, without the enactment of an air law. That an air law must be at least national in scope is evident from the very nature of aviation and considering the distances already covered by commercial air routes the advantage of a law which is internationally uniform is apparent.

"Efforts to establish an American air law have encountered a fierce conflict in regard to the form of the supervising organization and as yet have been without tangible results. It is gradually being realized by all those concerned with the future of American commercial aviation that the need for an air law is so pressing that its method of administration is a secondary consideration. When this attitude becomes general substantial progress may be expected. Wise regulation may be expected to give a certain stability to the air transportation industry essential to any industry which must appeal for credit and for investment capital. Until this is attained air transportation cannot be said to be on a business basis."

Artificial Silk

ARTIFICIAL silk may offer severe competition to the natural product of the lower grades as a result of present conditions in the silk market. The National Bank of Commerce in New York declares in its magazine, *Commerce Monthly*, that the greatly increased capacity of domestic producing plants indicates that American manufacturers of artificial silk goods may in the future be practically independent of foreign supplies.

"The position of the United States in international trade in artificial silk has been radically changed since the beginning of the war," the bank says. "For some ten years before domestic production began in 1911 the United States imported artificial silk threads and yarn, although the quantities are impossible to trace before that year. From 1911 until 1915 both production and importation increased, the former more rapidly, so that in 1915 about 60 per cent. of the total consumed in the United States was produced at home. The submarine warfare and the intense need of all textile materials in Europe, coupled with a reduced production in most European countries, caused a sharp decrease in imports at the same time that production in the United States was rapidly expanding. In consequence 98 per cent. of the 1918 consumption was of domestic manufacture. Soon after the close of the war European production was resumed and expansion begun and American imports in 1920 and 1921 approached in volume and greatly exceeded in value the high figures of 1914 and 1915 despite a greatly increased domestic production. In 1920 domestic yarns comprised about 80 per cent. of the total consumption.

"The first producing plant in the United States was established in 1911 as a branch of an English firm and used the viscose method. For many years this was the only important produce in the United States. From the 1911 figure of 320,000 pounds the production of this concern mounted to 9,000,000 pounds in 1920 and at the present time expansion is under way which will more than double its capacity. The increased demand for artificial silk in 1920 led several other large concerns to enter the field. The most important of these are affiliated with prominent manufacturers in Belgium, France and Italy.

"Although the potential production of plants now operating or under construction is far above any consumption figure yet attained, manufacturers believe that the market for artificial silk has as yet been only partially developed. It is significant that except for the latter part of 1920, when all textile industries suffered a depression, the demand for artificial silk from the beginning of the war so far exceeded the supply that the output of American plants was allotted to important consumers and until recently has rarely been sold in a freely competitive market. American producers have made little effort to expand their market as it was impossible during the war to increase production to supply new customers.

"Of the total consumption in the United States the largest share used in any one industry is in the manufacture of hosiery. In the last few years the production of sweaters and other knitted goods has been important. Artificial silk is woven with natural silk, cotton or other fibre into dress goods, such as satins and fancy silks, and shirtings and tapestry. Plushes, carpets and imitation furs are now made of artificial silk and many kinds of fringes, tassels and novelties.

"The manufacturer of artificial silk has also the opportunity of developing other products with the same equipment and raw material. By increasing the size of the aperture through which the cellulose solution is forced artificial hair may be produced, of value in the manufacture of hats, upholstery materials and fancy goods. By changing the shape of the apertureto a horizontal slit, he may make artificial straw, or by further widening the slit strips of artificial leather or cloth, films, ribbons or thin transparent sheets such as are used in facing envelopes and wrapping candies.

"A method has been devised in which net and simple forms of lace are produced in one operation, by passing the solution into engraved lines on a revolving cylinder, from which the finished product is continuously peeled as it issues from the fixing bath. Further progress in this direction may be confidently expected as the possibilities of cellulose are as yet far from exhausted.

"Artificial silk is chemically unlike natural silk and differs in most of its physical properties so that there has not been direct competition between the two fibres. In the period of activity in textile markets which followed the close of the war the demand for both these fibres exceeded the supply. Such substitution of artificial silk as was possible served only to release natural silk for other purposes. The present condition of the silk market, however, offers the possibility of severe competition between artificial silk and the lower grades of natural silk as the supply of the latter is in excess of immediate needs.

"In view of the greatly increased capacity of American producing plants, and of the apparent policy of foreign producers to affiliate with producers in the United States rather than to obtain a market in the United States for foreign products, it is probable that American manufacturers of artificial silk goods will in the future be practically independent of foreign supplies, and it is even possible that yarn may be exported in important quantities. The variety of sizes and kinds of artificial silk which can now be produced in the United States leaves little to be feared from foreign competition, and the export trade in hosiery and other manufactures has a promising future."

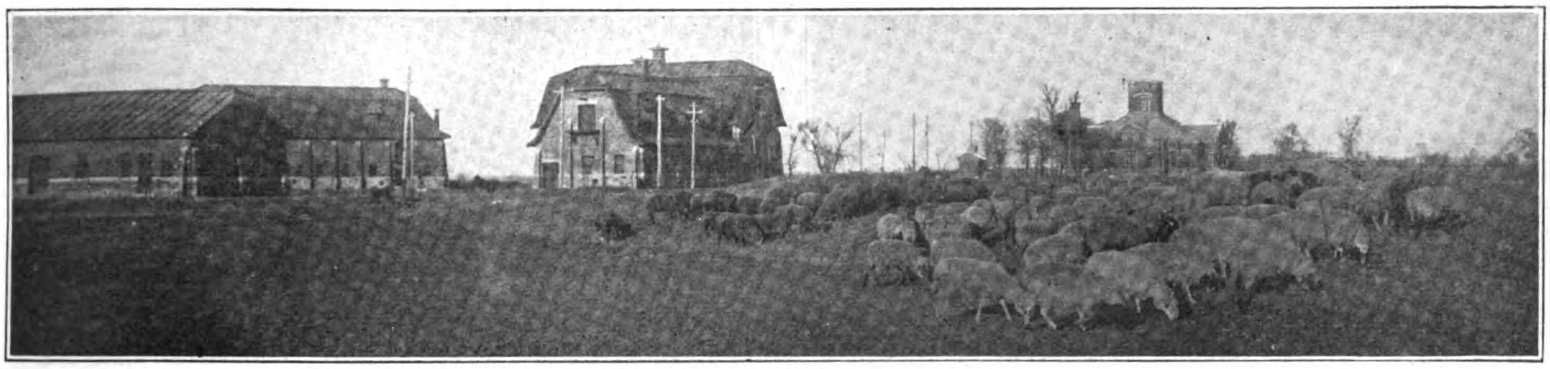
Fushun-Mukden Power Service

The electric power transmission system from Fushun Collieries to Fengtien (Mukden), in course of construction since last year, under Sino-Japanese joint management at the cost of Y.560,000, has been completed, and the actual transmission of power may be opened by the middle of February.

This project was conceived five years ago, but actual work has been deferred owing to the difficulty of securing the consent of the Chinese. Mukden had been feeling the inadequacy of power supply. Such plants as the Manchuria-Mongolia Woollen Manufacturing Co., the Manchuria-Mongolia Fibre Industry Co., and other plants have been suffering from the short supply of motor power. Against the 1,400 kilowatt capacity of the present power station, the monthly demand runs up to over 300,000 kilowatts. When the new arrangement comes into operation, 3,000 kilowatts will be supplied from Fushun, which will prove sufficient for the few years to come. The capacity of the new installation may be raised, with a little alteration, easily to 6,000 kilowatts.

MANCHURIA and MONGOLIA

The Lands of Opportunity



Sheep Grazing at the S. M. R. Agricultural Station at Kungchuling

I. Geography

GEOGRAPHICAL SCOPE.—There is no definite boundary to what is generally called "Manchuria and Mongolia." What are often referred to as Japan's special privileges in Manchuria and Mongolia are embodied in various treaties, protocols, etc., and allude to rights in South Manchuria and the Eastern Inner Mongolia.

ADMINISTRATIVE DISTRICTS.—Manchuria consists of the three provinces of Fengtien, Kirin and Heilungkiang, subdivided into the following minor districts :—

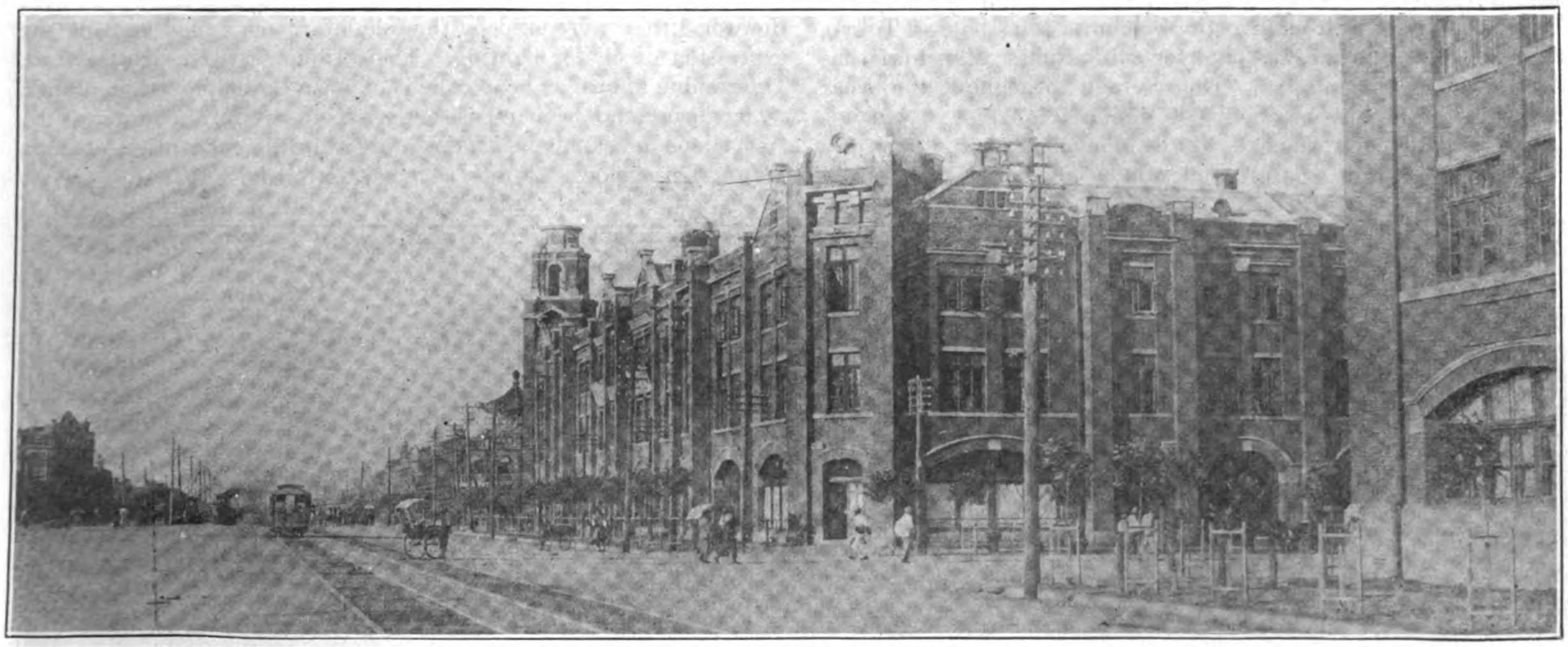
Fengtien into 5 *tao* (district superintendencies) and 57 prefectures ;
Kirin into 4 *tao* (district superintendencies) and 39 prefectures ;
Heilungkiang into 3 *tao* (district superintendencies) and 31 prefectures.

Each province has a *tuchun* (military commander) to supervise military affairs and a civil governor under whom are the *taoyin* (district superintendents) and prefects. The real political power is, however, held by the military commander.

Eastern Mongolia is divided into the four tribes of Chelimu, Chasakotu, Chaowuta and Hsilinkuoerh, subdivided into thirty clans, each having its own chieftain. The Mongolians being nomads, the waste lands in their country are being colonized by Chinese.

TOPOGRAPHY.—The eastern part of Manchuria is mountainous, and borders on the Russian littoral provinces and Chosen by the Ussuri, the Tumen, the Changpai range, and the Yalu. On the west, the vast level plain of Mongolia stretches afar to the horizon, part thereof being walled by the Hingan range. On the north, it adjoins the Russian Amur province across the Amur, whilst on the south the Yellow Sea and the Gulf of Pechili wash its shores. For some distance, it borders on China proper following the Great Wall. The Mongolian plain is undulating and contains deserts and alkaline belts. The rivers are the Liao, the Sungari with their tributaries, the famous Yalu and Tumen, the Muling, etc. The valleys of these rivers are fertile, highly suited to cultivation. Even in the hilly regions, there is little space admitting of reclamation.

AREAS AND POPULATION.—There are no accurate statistics about either land areas or population.



The New City of Mukden with wide avenues and beautiful buildings created in the Japanese railway zone. The Chinese city in all its squalor and dirt lies three miles distant, connected with the S. M. R. Railway Station by a horse tramway

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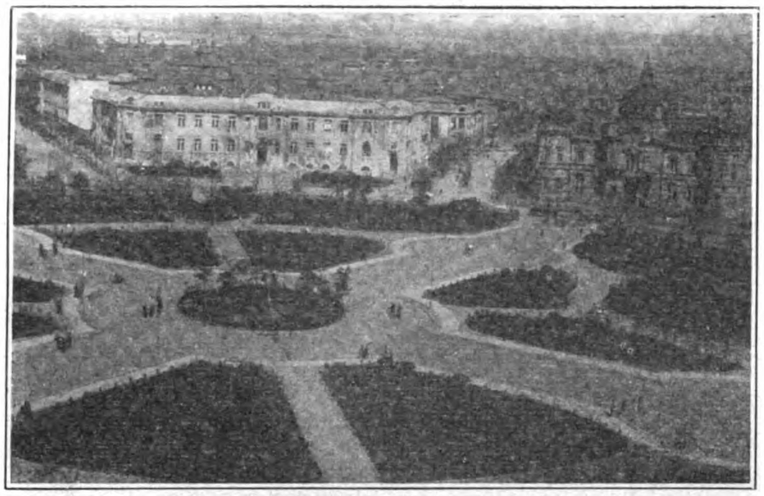
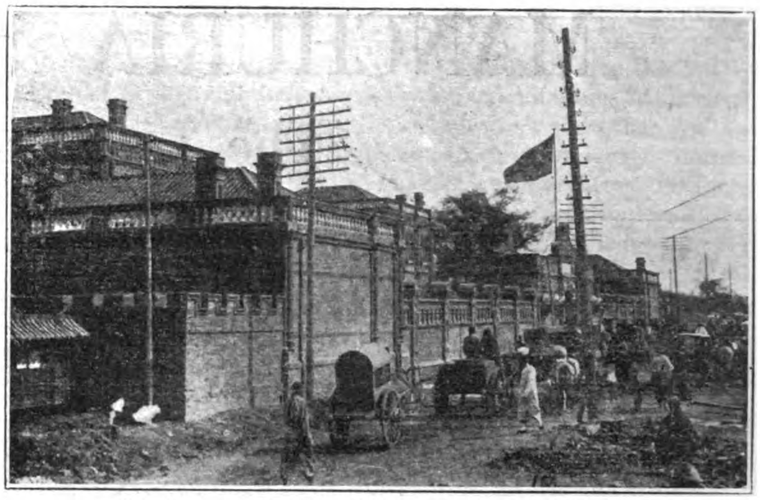


The Magnificent Civic Centre at Dairen



The Yamen of Marshal Chang Tso-lin, at Mukden

According to a recent estimate of the South Manchuria Railway Company, the areas and population of Manchuria and the Eastern Inner Mongolia are as follows :

	Area square *ri*	Population
Fengtien province..	15,151	11,979,400
Kirin province	13,605	5,638,700
Heilungkiang province	35,497	2,494,000
Eastern Inner Mongolia	10,168	4,366,000
Total	74,421	24,478,100

Remarks: 1 square *ri* is approximately 6¼ square miles.

The above shows that Manchuria and Eastern Inner Mongolia are far larger in area than Japan, but with only one-third the latter's population. The average density of population is 330 per square *ri*. In Fengtien province, the land under cultivation reaches 60 per cent. of the arable area and has the highest density of population. Manchuria is inhabited by Manchus and Chinese, and Mongolia by Mongolians and Chinese settlers. There are also about 600,000 Koreans, 1,200 Russians and 200,000 Japanese. Chinese farmers are taking up land in large numbers, and with the natural increase of population, the annual rate of increase is placed at between 400,000 and 500,000.

CLIMATE.—The climate of Manchuria and the Eastern Inner Mongolia is what is called "continental" with extremes of heat and cold. People labor under the impression that Manchuria is frigidly cold, forgetting that its summer is intolerably hot. In summer, both South and North Manchuria is as hot as Tokyo. This makes Manchuria a fine land for cultivation. Manchuria has far less rainfall than Japan. The average throughout the year is one-third of Japan's or about 600 millimetres, most of which is bad in June, July and August. In the Mongolian plain, it is windy in spring. No storm or torrential rain is known in autumn.

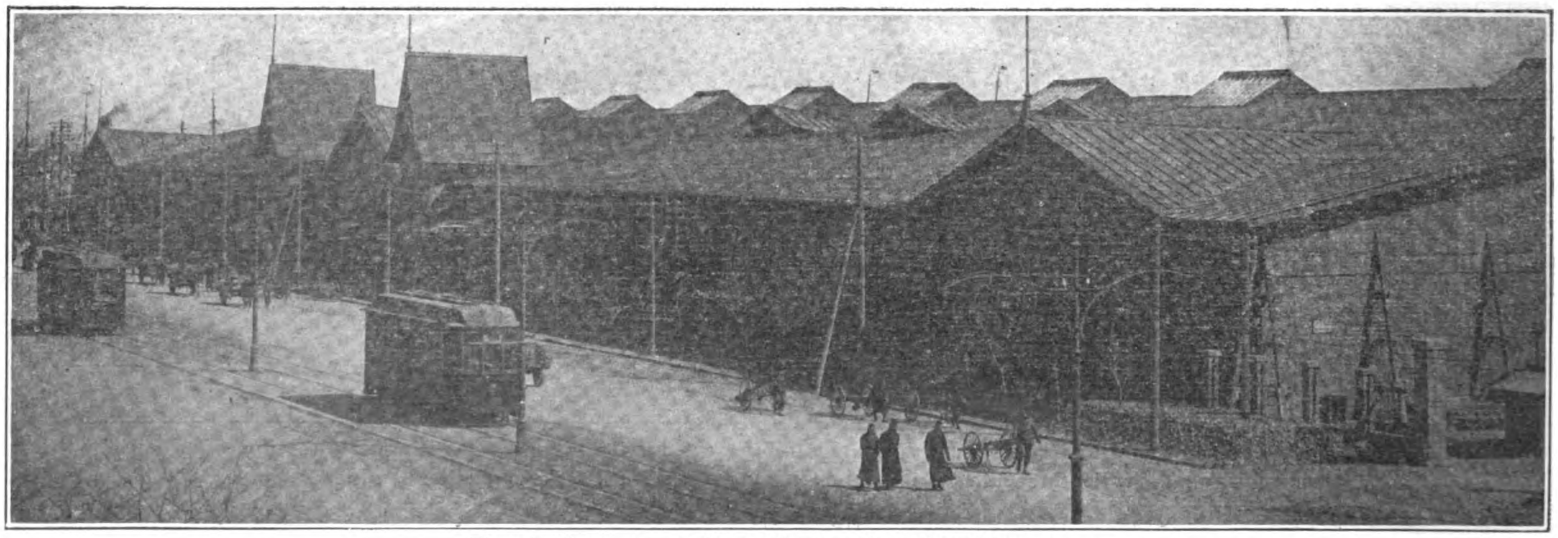
II. Agriculture

RAILWAY AND DEVELOPMENT OF AGRICULTURE.—The vast plain of Manchuria and Eastern Inner Mongolia is covered with layers of loam, clay and humus, making one of the most fertile agricultural countries in the world. The Chinese Eastern Railway, the South Manchuria Railway, and the Peking-Mukden line of the Chinese Government Railways carry annually large numbers of immigrants and immense stocks of produce, facilitating the development of agriculture

According to investigations of the S. M. R. Co., the total area under cultivation is about 39,100,000,000 *tsubo*, of which 32,510,-400,000 *tsubo* is in Manchuria and 7,692,000,000,000 *tsubo* in Eastern Inner Mongolia. The farming lands awaiting cultivation is put at about 30,000,000,000 *tsubo*, of which 80 per cent. lies in Heilungkiang province. The annual increase of area under cultivation ranges from 900,000,000 to 1,200,000,000 *tsubo*.

(*a*) BEANS.

Beans may be classified into yellow (soya) bean, blue and black beans. In fact, there are more than two hundred species of beans. The yellow (soya) beans belong to the most common species, containing a good percentage of oil and are used as an article of food and for the expression of oil. Now widely known all over the world they were used by the inhabitants as a food and for the expression of oil for lighting. The residue served as cattle feed. The residue known as bean cake is extensively employed in Japan as fertilizer, and bean oil is exported to western countries. A marvellous development has been noted in the cultivation of soya bean. This belongs to only a recent date.



Electric Tramcars and Goods Sheds at the Dairen Wharves

Bean milling industry, too, has correspondingly grown up, and along the South Manchuria Railway lines, and especially at Dairen, there are a large number of bean mills on a considerable scale. The beans, bean cake and bean oil exported from the port of Dairen have reached 3,000,000 tons annually in recent years.

The Chinese not only use beans and bean oil in their daily cooking, but also *tofu* (bean curd palatable also to the western palate and pronounced by the qualified chemist as similar in its composition to cow's milk), *miso* (an article of the staple food to both Japanese and Chinese), and *soy* are also made from beans. Bean oil exported to the west is understood to be refined as substitute for cottonseed oil, peanut oil, linseed oil, etc., and even for animal fat. It can be made into soap, oleomargarine and paint. New utilities are being invented for beans and bean oil.

Beans put out in Manchuria and Mongolia are put at about 20,000,000 *koku* (1 *koku being equivalent to* 4.96 *bushels*), but the outputs are increasing rapidly year by year, and there is a vast area of territory awaiting cultivation.

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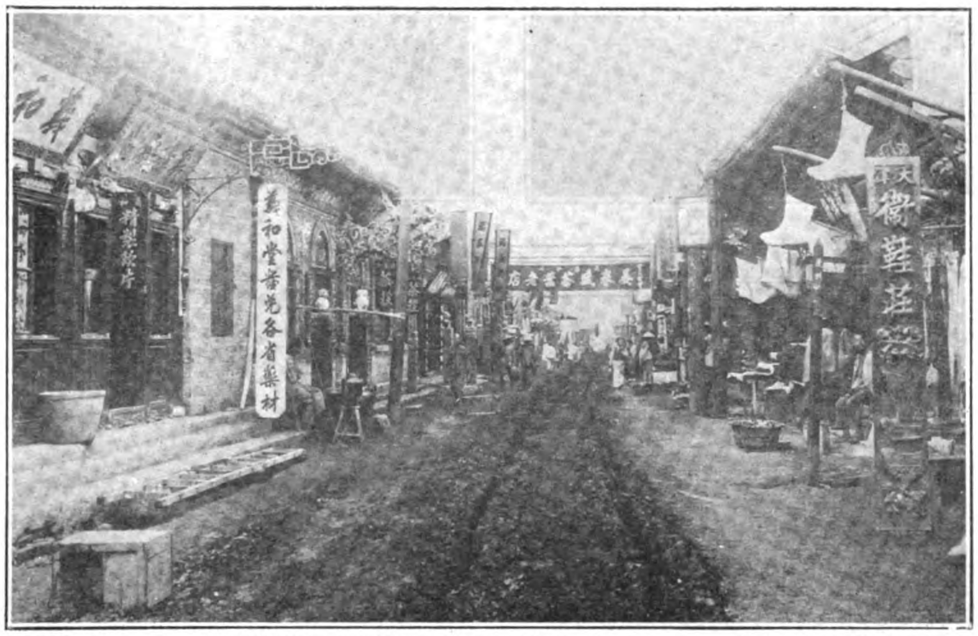


The Main Street of the Chinese City of Changchun, the terminus of the S. M. Railway

The analyses of bean oil at different spots in Manchuria are as under, the average of ten samples being given :—

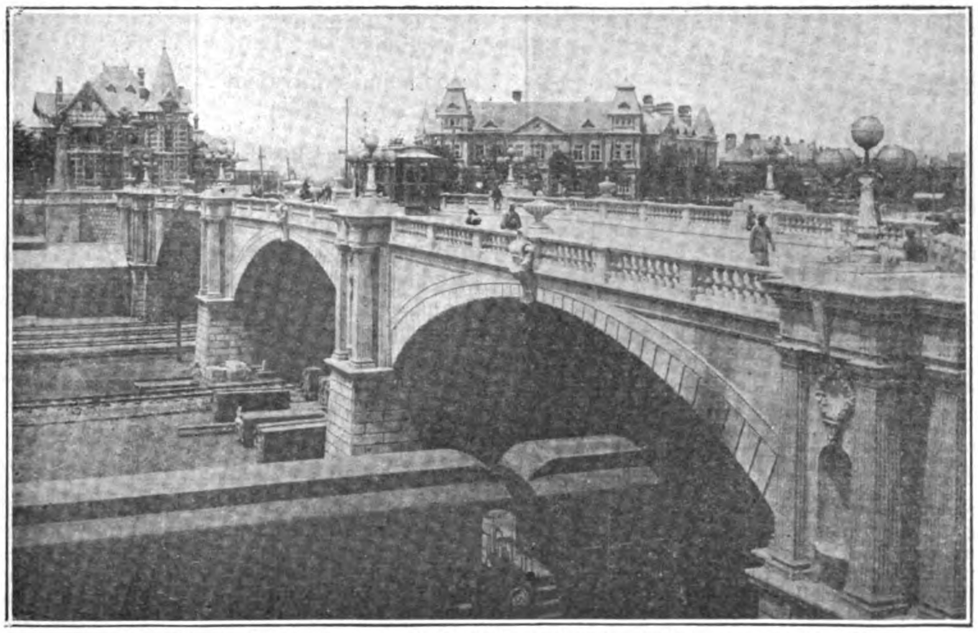
At	Oil	Water
Harbin	17.77 %	11.90 %
Changchun	18.16 %	10.27 %
Kaiyuan	18.14 %	10.76 %

Next, the results of analyses of beans of different kinds are as follow, the average of several samples being given :—

Beans	Crude oil	Albumen	Carbohydrate
Yellow (soya) ..	11.78 %	16.92 %	14.99 %
Blue	37.32 %	37.62 %	38.65 %
Black	21.77 %	22.19 %	26.06 %

(*b*) Kaoliang.

Kaoliang is ubiquitous in Manchuria. It is grown most extensively and is the chief of the staple food of the natives. For this reason, in North Manchuria, in which *kaoliang* is produced in less quantity than in South Manchuria (while the cultivation of wheat is incomparably larger), a restriction is put by common consent upon the amount of *samshoo* (a kind of alcoholic drink) distilled from the same cereal.



The Nippon Bridge over the S. M. Railway Tracks at Dairen connecting the old Russian Town with the Modern City

Kaoliang is first husked and cleaned before being cooked in the form of gruel or being boiled and then sun-dried. It is also used as fodder.

Recently, a Japanese resident at Dairen has hit upon a process by which a fair imitation of rice can be made from *kaoliang* in shape and taste.

As previously hinted, *samshoo* is distilled therefrom in large quantities.

The *kaoliang* stalk is used as fuel and a building material, and further matting is made therefrom. Its uses are varied as well as extensive.

The annual outputs of *kaoliang* are estimated at 36,000,000 *koku*.

(*c*) Italian Millet.

Italian millet, when cleaned, is called *hsiaomi* (small rice) by the Chinese. Its importance ranks only next to *kaoliang*. An intoxicant known as *huangchu* (yellow drink) is brewed therefrom. It has divers species, and the tallest grows as high as from 6 to 7 feet.

The millet straw supplies the chief fodder for the domestic cattle, whilst the millet bran serves as hog feed. On this account, the millet, too, is raised everywhere, its yearly production being placed at 30,000,000 *koku*.

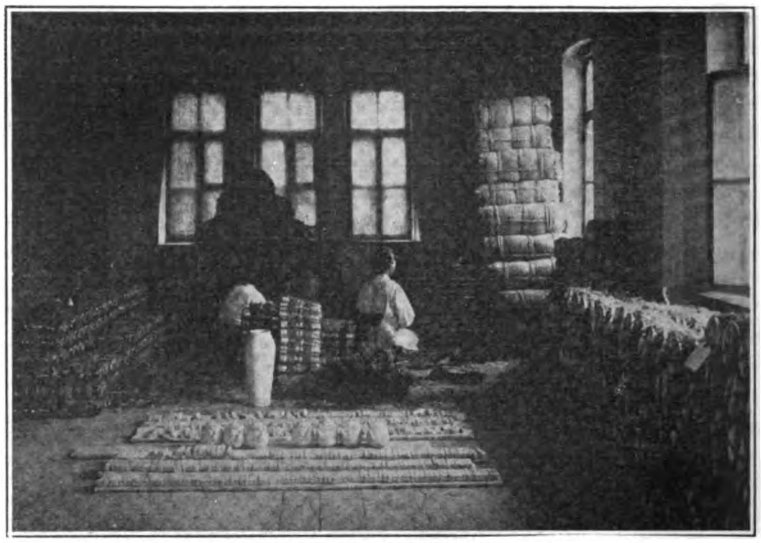
(*d*) Maize.

Maize may be subdivided into three kinds—yellow, red and a native breed called *laolaichou*. It is grown in the south of South Manchuria and also in part of North Manchuria and also forms an important article of food. In North Manchuria, an intoxicant is brewed from it. The stalks are used as an article of fuel whilst the leaves are good for fodder. The annual outputs are about 10,000,000 *koku*.

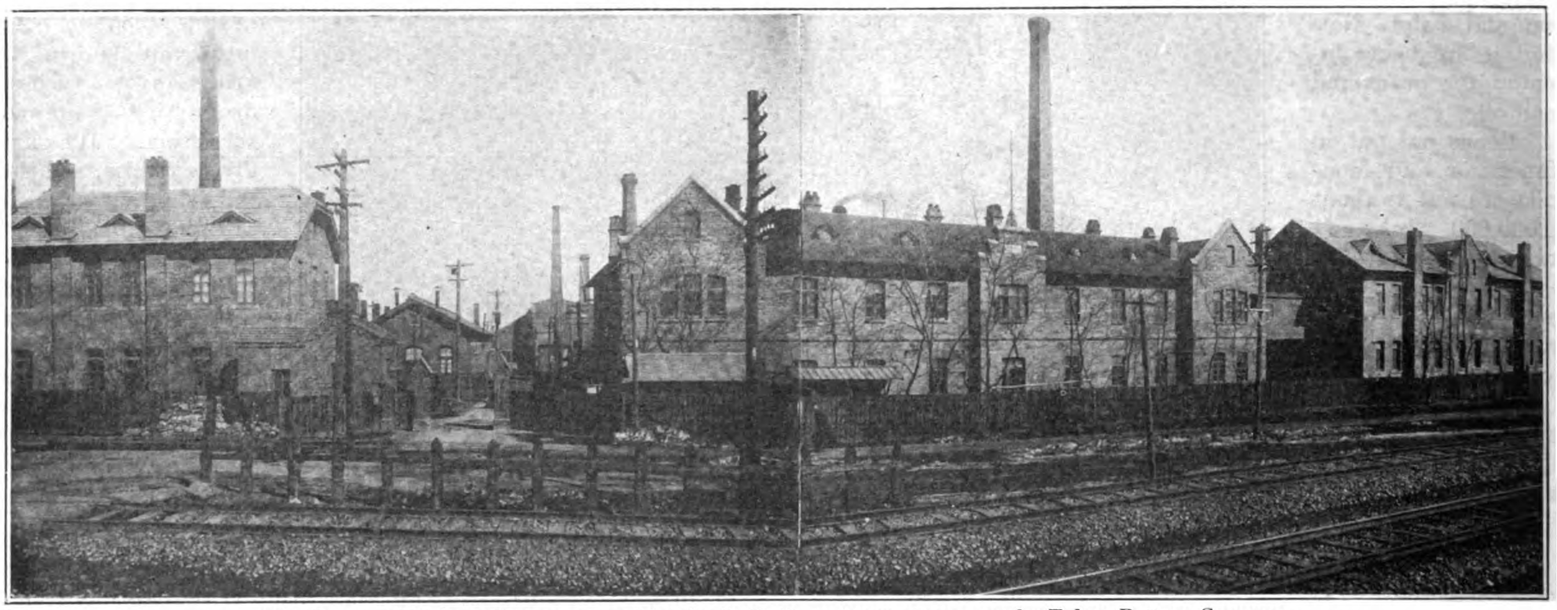
(*e*) Rice.

Rice is known as *tami* (large rice in distinction from *hsiaomi*, small rice or millet) among the Chinese. It is a valuable article of food too to the Chinese peasantry. Upland rice, which is grown on dry farms, is produced to the extent of about 3,000,000 *koku*, and ordinary rice raised on paddy fields to the extent of about 500,000 *koku*, in both cases unhulled. It may be mentioned that the growing of ordinary rice has been undertaken in Manchuria only in recent years, and is therefore still produced to an inconsiderable amount. However, both soil and climate are well suited to its cultivation. The Korean settlers in Manchuria

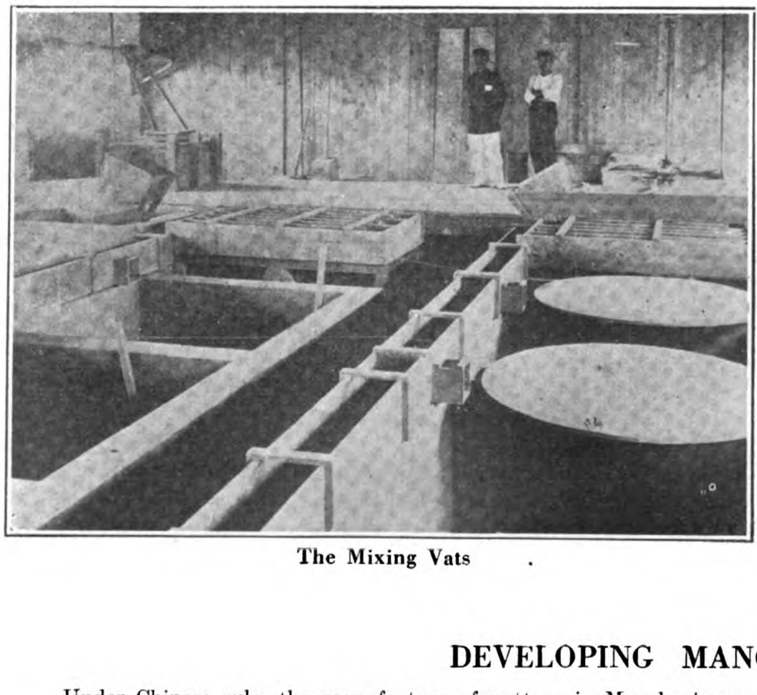
Decorating Bowls



Packing for Shipment



The Ceramic Works at Dairen erected by the S. M. R. and turned over to the Tahua Pottery Company

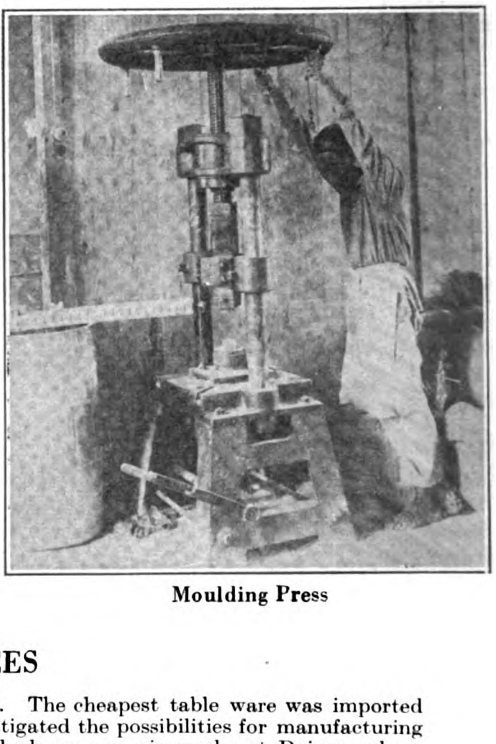


The Mixing Vats

nearly monopolize the cultivation of this cereal. The amount of cultivation is expanding yearly at a rapid pace. The land area open to rice farming is estimated at 4,500,000,000 *tsubo* (1 *tsubo* being equivalent to 36 square feet).

(*f*) Other Crops.

Among other agricultural crops popularly grown may be enumerated red beans, kidney beans, millet, wheat, cock'sshin, buckwheat, oats, potatoes, etc.



Moulding Press

DEVELOPING MANCHURIAN RESOURCES

Under Chinese rule, the manufacture of pottery in Manchuria was confined to coarse earthen ware. The cheapest table ware was imported from other parts of China. The central laboratory of the South Manchuria Railway at Dairen investigated the possibilities for manufacturing fine white china and glassware from native raw materials and the result was the establishment of the large ceramic works at Dairen, whose management in 1920 was handed over to the Tahua Pottery Company. At present the works turn out a superior grade of table crockery, insulators, and especially bowls for Chinese consumption. The products are being exported even to Japan.

Next, as regards crops for special uses, hemp, flax, tobacco, sesamum, perilla, melon-seed, etc., are grown.

The hemp and flax crops are placed at some 40,000,000 *kin* a year. The tobacco is produced in Kirin province to the annual amount of about 50,000,000 *kin*. Still, the supply being inadequate, about Y. 6,000,000—7,000,000 worth is being imported yearly.

Next, turning to agricultural crops introduced lately, the sugar beet has been found to thrive excellently. The flax is looked upon in a similar light.

In the belt from the Kwantung leased territory up north to Mukden, the orchard industry is pronounced as promising. For instance, superior species of apples, pears, grapes, etc., are produced recently in increasing quantities.

METHOD OF CULTIVATION.—Agriculture in Manchuria may appear crude to a casual eye, but when one looks deeper into its methods, one will easily find that what are in vogue are sensible devices adapted to climate and soil and developed through stages. In harrowing and ploughing, oxen, horses and mules are employed to draw the ploughs and harrows, and rollers are brought to play in levelling work after the western fashion. Domestic cattle are utilized to economize human labor, and in these respects, the Manchurian methods differ from the Japanese ways.

In fertilizing lines, droppings of the domestic animals and night soil are mixed with rich soil and are left in heaps, exposed to the weather for about three years. Chemical fertilizers still remain strangers to the native peasantry.

In dealing with the cereals, after they have been harvested, the grain is unhusked with the help of the domestic animals, and then it is packed in gunny or cotton bags to be carted to the market. The domestic animals are used also in cleaning the grain and in the home milling of flour.

Insects' ravages are considerable in some years, but the peasantry, whose heads are crammed with old superstitions, hold them as little short of a visitation and do not trouble themselves with their extermination or prevention. Luckily, the happy climatic effects Manchuria act fatally upon these insects, and it is through this natural boon that their harm is not more serious.

MANAGEMENT.—Farming is carried on by the land-owners and the tenants. The tenaney system may be divided into three kinds, ordinary, profit sharing and contract plans. In extensive farming, in some cases, over 300,000 *tsubo* of land is looked after by a single family. Those attending from 60,000 *tsubo* to 150,000 *tsubo* of land each are rated as farmers of intermediate class. The petty peasants have only 15,000-60,000 *tsubo* to till, and in many cases, not more than 4,000 or 6,000 *tsubo*.

In Manchuria there is an element that is termed as farming hands who are helpers immigrating into Manchuria from Shantung, etc., which are more densely populated.

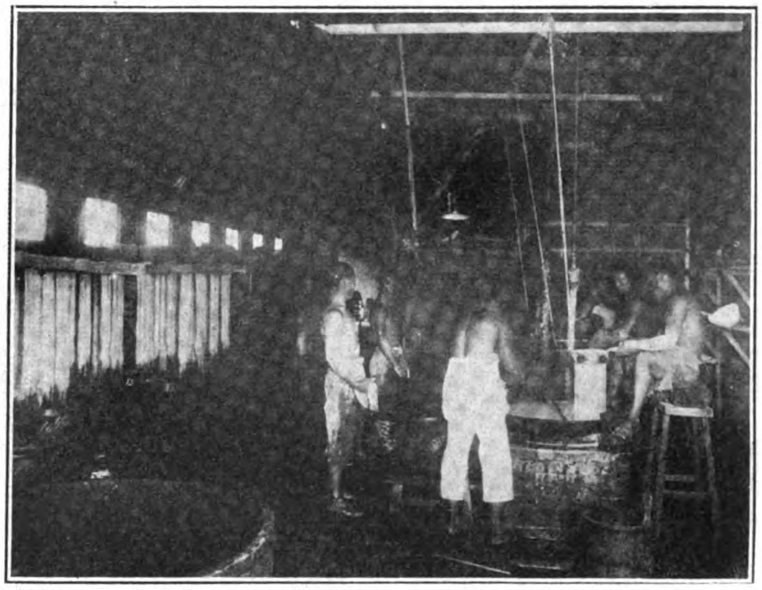
AGRICULTURAL INSTALLATIONS.—In lines of agricultural installations, the Chinese authorities maintain agricultural experimental stations at Fengtien (Mukden), Kirin and Tsitsihar.

The South Manchuria Railway Company, having recognized early the urgent necessity to improve and advance the argicultural methods in the development of Manchuria and Mongolia, has founded an experimental station at Kungchuling and Hsiungyocheng each at enormous outlay, and has been carrying on the investigation and experiments of agricultural methods, stock farming and afforestation.

An experimental station for the cultivation of the tobacco has been opened at Telissu between Wafangtien and Hsiungyocheng.

In addition, minor experimental stations are maintained at Chengchiatun on the Ssupingkai-Taonan line of the chinese government railways.

At the Kungchuling station, such corps comparatively new in South Manchuria as sugar beets, tobacco, flax, etc., are being experimentally raised, while the improvement of the bean breed has been receiving special attention. The stock-farming division has conceived the idea of improving the sheep breed, and incidentally the hog breed.



Making Vermicelli at Wangchiatun near Dairen, for Chinese consumption

At the Hsiungyocheng station, sericultural industry, fruit raising, horticulture, and afforestation have been studied.

These investigations and experiments are expected to bring in important results to the agricultural Manchuria.

III. Stock-Farming

STOCK-FARMING COUNTRY.—The Japanese farmers are short zsen of cattle for use in the field. Therefore, Japanese agriculture is often referred to as "agriculture without animal help." In striking contrast with this state of things, in Manchuria, stock farming is indeed almost universal among the farming classes, and few farming houses are met with that do not keep at least three or four heads of cattle, horses, mules, etc., and some pigs and poultry, into the bargain.

It may be said that the Chinese are not always more attached to stock-farming than the Japanese, but they beat the Japanese hollow in the knack of domesticating and training the domestic cattle. Five or six head of cattle, horses, mules or donkeys are hitched up at random to a heavily-loaded cart, and this motley team is managed with admirable dexterity by a Chinese driver with the cracks of whip in hand.

As to the Mongolians, they are nomads, and the live stock serves as the only means of sustenance to them. In other words, they keep live stock consisting of cattle, horses, sheep, etc., and lead a nomadic life from place to place.

We shall now give a resume of the stock farming in Manchuria.

(*a*) HORSES.

Manchuria and Mongolia are what has been referred to from old times in China as the finest horse breeding centre. The horse all belong to the Mongolian breeds. They stand 4½-ft. and 4.75-ft. long, weighing 583-lb. on an average. They are rather undersized but well proportioned. They are built very strong and are used to coarse feed, neglect and even exposure; moreover they have endurance to a wonderful degree. In ordinary circumstances, those that can pace are used for riding purposes, and the others as draught animals.

According to the latest returns prepared by the South Manchuria Railway Company, the horses in Manchuria and Inner Mongolia number about 2,500,000 head, comprising 750,000 head in Fengtien province, 500,000 head in Kirin province, 510,000 head in Heilungkiang province and 810,000 head in the Eastern Inner Mongolia.

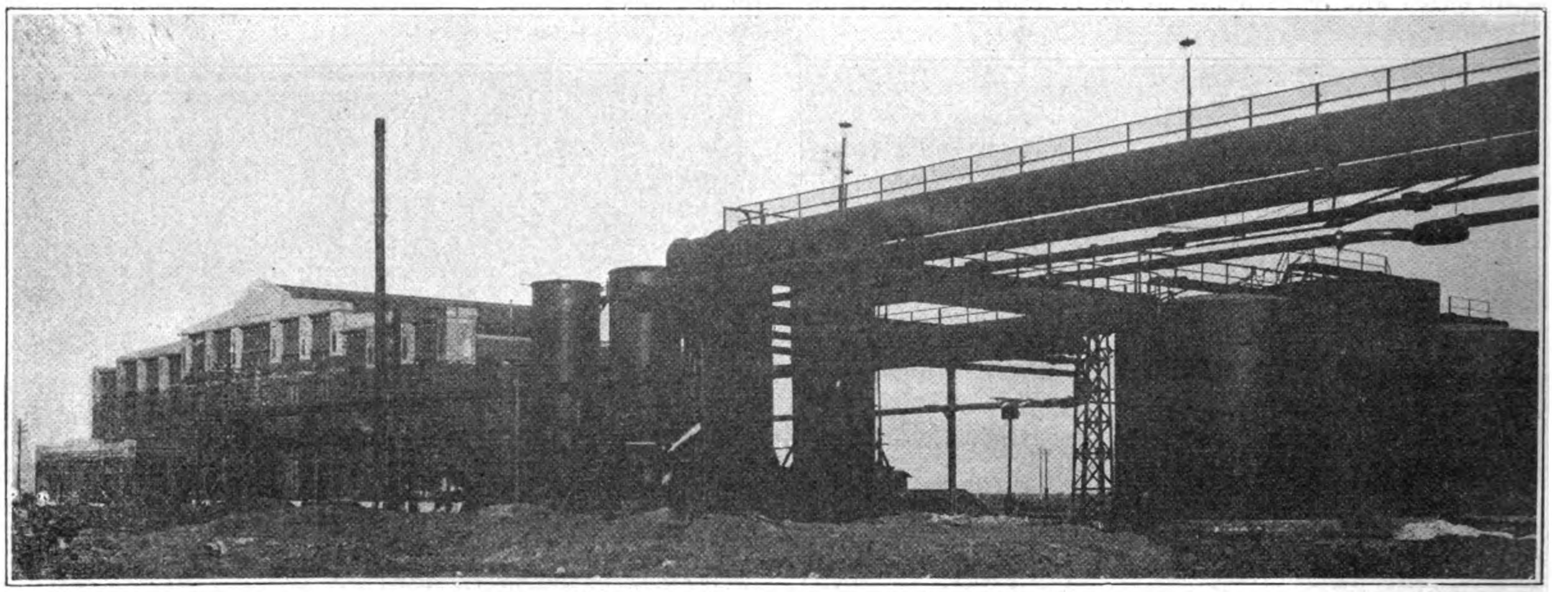
(*d*) CATTLE.

The cattle in South Manchuria, etc., belong to the Korean, Shantung, Manchurian and Mongolian breeds. The first mentioned two breeds are comparatively small in number, the last mentioned two constituting the majority.

The Chinese keep cattle to work them, and the Mongolians for the milk they yield, the beef being regarded as by-product.

The cattle in South Manchuria and Inner Mongolia are defectively developed in hinderpart and are rather inferior in all economic efficiency. But these drawbacks are made up by their power of endurance and docility, and that of withstanding neglect and exposure, which qualifications all go to befit them for hard labor. In weight, the heaviest is 1,166-lb., those weighing 666-lbs. being most common. Accordingly, they give a comparatively meagre amount of beef. In quality, the native breed is classed below the Korean and Shantung breeds, and gives only a stinted amount of milk. There is ample room for future improvement with the cattle as with the horse.

The cattle in Fengtien, Kirin, Heilungkiang, and the Eastern Inner Mongolia are put at 580,000 head, 90,000 head, 210,000 head and 1,120,000 head respectively, making the grand total of over 2,000,000 head.



Sulphate of Ammonia Factory at Anzan, South Manchuria

(*b*) MULES.

The mule is the cross breed between the she-donkey and the he-horse. It has existed in Europe and China from early times, but has been unknown in Japan. In size, the mule varies according to the sizes of its parent-animals, but is, in many cases, larger than the horse. This is because the he-donkey used for breeding purposes is what is known as the larger donkey standing from 4-ft. 7-in. to over 5-ft.

The mule is employed in both farming and transport. It has great endurance and is inured to hard labor of a long duration, ill-fed and ill-sheltered. It costs dearer than the horse.

There are 200,000 head thereof in Fengtien province, 230,000 head in Kirin province, 120,000 head in Heilungkiang province, and 70,000 head in the Eastern Inner Mongolia, totalling 630,000 head.

(*c*) DONKEYS.

What belongs to the class of smaller donkeys is commonly kept in the native households. One stands only about 3-ft. It is strong of body and thrives on coarse feed. Its bearing strength is great for its size, and this makes it suited to agricultural, domestic, and transport uses. Some 500,000 head thereof are in South Manchuria and about 100,000 head more in the Eastern Inner Mongolia.

In the Eastern Inner Mongolia, cowhides are put out in a considerable quantity, but owing to their poor quality and also the parasitic worm that eats out many holes in important parts, they have but an insignificant value.

(*e*) CAMEL.

The camel is found only in Mongolia. It is double-humped and stands 5½-ft. usually. It withstands the cold and is adapted to hard labor and is good to ride on. For this reason, it is an important medium of travel in Mongolia. Its number is put at about 4,000.

(*f*) SHEEP AND GOATS.

The sheep and goats are of Mogolian breeds. Hitherto they have been raised chiefly for their meat and skins, and the wool have been regarded as but a by-product.

The ewe weighs from 58-lb. to 83-lb.; the ram weighs about 125-lb. at the outside. One of its characteristics lies in storing nutrition in the fat rump.

Goats are a little smaller in size than sheep. They yield only a small quantity of wool.

The sheep gives not more than 3-lb. of wool each of a quality far from passable. Most of it has been exported to the United States.

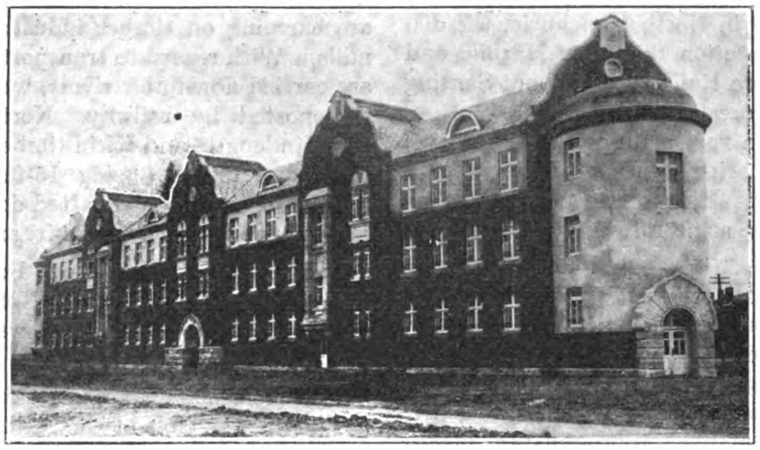
On the other hand, the goats' hair is of finer quality, but is a matter of only a little more than 1-lb. per head.

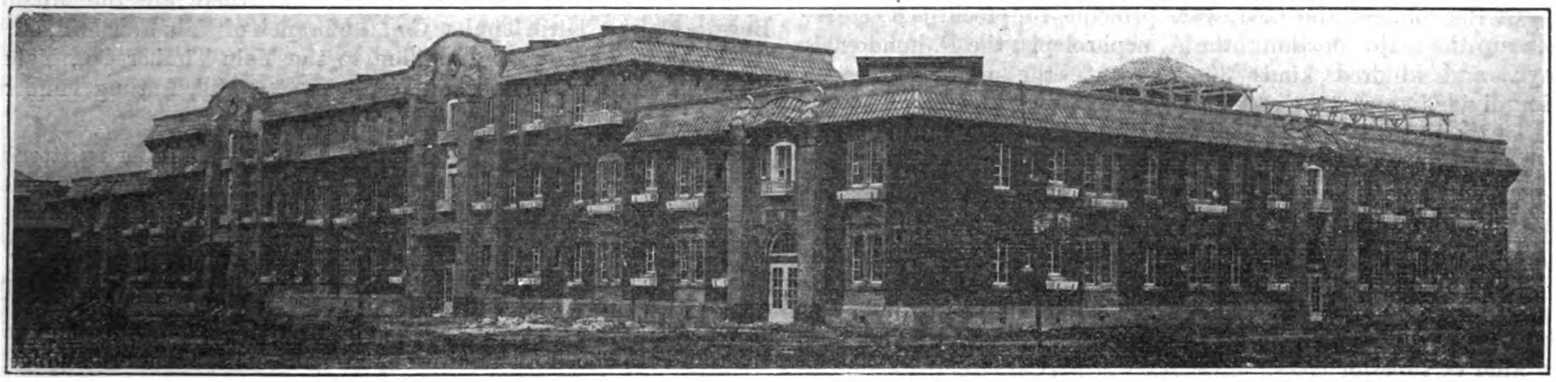
With the recent development of woollen industry in Japan, both wool and goats' hair have begun to be exported to Japan in a considerable quantity.

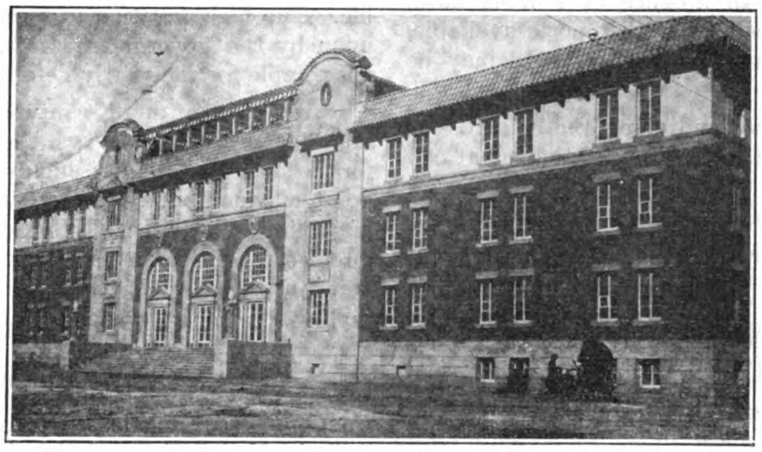
In South Manchuria, goat-raising takes precedence of sheep farming among the Chinese. In Mongolia, the natives attach the highest importance to sheep-raising. In both cases, more or less mixed farming is in vogue. To the Chinese, sheep- and goat-raising is only a secondary occupation, but to the Mongolians, live stock forms the principal property asset and the chief item of sustenance.

Judging by the outputs of wool and goats' hair, both sheep and goats combined are put at 400,000 head, 100,000 head, 60,000 head and 2,000,000 head in Fengtien, Kirin and Heilungkiang provinces and the Eastern Inner Mongolia respectively, making the total of 2,660,000 head.

Seen from the traditional aims of sheep- and goat-farming more for the sake of the meat than for the wool, no improvement seems necessary, but since the greater utility of wool than the meat itself became more widely known, the benefit of a systematic improvement on scientific lines has come to be noted more keenly.







How the South Manchuria Railway Company houses its Employees
Top and centre: Offices and Quarters at the Azan Iron Mines and Steel Works.
Bottom: Batchelor Quarters at Dairen.

(*g*) PIGS.

Pork is accepted by common consent by the Chinese as the most palatable. Hogs are kept at every farm house from a few to a dozen head. The grounds and waste put out from the *samshoo* distilleries, flour mills, bean curd manufacturers, etc., are used for pig-feed.

A rough calculation of the total number of pigs names 3,550,000 head for Fengtien province, 1,250,000 head for Kirin province, 490,000 head for Heilungkiang province, and roughly 1,000,000 head for the Eastern Inner Mongolia, the grand total being placed in the neighborhood of 6,690,000 head.

In Manchuria, there are three classes of the pig. One kind is larger-sized and weighs some 292-lb. when $2\frac{1}{2}$ years old; another kind grows to weigh 150-lb., when a year old, and is known as smaller-sized; the other is medium-sized. Each kind breeds fast, and brings forth a litter of young numbering from ten to twenty at a time. The pigs' hair is coarse and long and is known as bristle, being a product of no mean importance. Bristle is exported abroad to be made into brushes. Most of it goes to Osaka, Japan.

HOW DOMESTIC ANIMALS ARE TENDED.—As stated previously, the domestic animals raised by the natives receive but a nominal amount of attention. Cattle other than milch cows, horses and mules are kept either in roughly-made sheds or in the open yard. Millet straw is generally used for feed and is often given, mixed with maize stalks, straw, bean stems and grass. For richer feed, *kaoliang*, bean cake, wheat bran, etc., are added.

The Mongolians never build stalls or other shelter for their domestic animals, but leave them to look after themselves.

Some Chinese furnish shelter, but seldom provide for bedding.

Pigs kept by the Chinese farmers are let loose in the daytime, and are put in the pen at night. The sight of lively pigs frisking after feed in the field after the crops have been harvested is one of the quiet rustic scenes in Manchuria. In winter, pigs are sometimes fed on hay laid by for them, but in the majority of cases, they are left to themselves to pick up feed.

The Mongolians seek lowlands in summer for water for their sheep, and in winter get behind the hills for shelter from the piercing wind.

The sheeps' skins clothe the Mongolians; their milk and meat serve as staple food-stuffs; and the wool is used to cover the huts and keep off the draught. Sheep to the Mongolians supply clothes, food and shelter.

EXPORTS OF STOCK-FARMING PRODUCTS.—As already stated, Manchuria and Mongolia abound in domestic animals, and wool, hides and leather, animals' bones, bristles, cheese and other dairy products are put out in a great variety and quantity. But, the methods of production remain all primitive and none of them have yet developed beyond the stage of a domestic industry. There is plenty of room for future development in this direction.

The following are the exports from Manchuria during 1918:—

	Tls.
Domestic animals, including cattle, horses, mules, pigs, sheep, etc.	527,825
Wool, goats' hair, etc.	461,131

	Tls.
Bristle and horses' hair	353,309
Leather and hides and manufactures	787,099
Eggs	143,710
Animal oils	461,895
Animal's bones	129,367

IV. Forestry

Disposition of Forests.—In South Manchuria, the foot of the Changpai mountains along the upper reaches of Sungari, the Mutan and the Tumen, and also the upper parts of the Yalu and the Hun are densely wooded; while in North Manchuria, the districts about Hailin on the eastern section (between Harbin and Pogranichnaya) of the Chinese Eastern Railway and about Sansing in Kirin province are the principal forest lands.

On the other hand, Mongolia is a vast plain consisting of level land grown with grass and dotted with dunes. Nothing like a forest can be seen. Only amongst the Hingan range and the Yinshan range, there are believed to be some forests worth tapping, but no definite data are obtainable.

Principal Kinds of Trees and their Percentages.—So far about 300 kinds of trees are known in Manchuria and Mongolia, but the principal kinds number about twenty.

All the forests and woods being natural ones, the percentages of the different kinds of trees are subject to variance, but the conifers and the broad-leaved trees may be approximately placed at the respective rates of 40 per cent. and 60 per cent.

Of the conifers, the L. d. var. principis-rupprechtii R. et W. takes up the major portion; the A. nephrolepis, the P. hondoensis Mayr., and kindred kinds 30 per cent., the minor remainder being divided among the rest.

Of the broad-leaved trees, the Q. Fabri Hance, Mongolian oak, T. Koreana Nakai, elm, poplar and their kindreds occupy some 70 per cent., the walnut, phellodendron amurense rupr., and such like being found in a meagre quantity.

In the forests of the Hingan range in the west of Heilungkiang province and in the north of Mongolia, the L. d. var. principis-rupprechtii R. et W., P. silvestris L., and B. japonica Sieb. (B. alba L. var. vulgaris D. C.), predominate, and there are found only few kind of superior trees.

Forest Areas and Assets.—In absence of reliable data, nothing definite can be set down, but from all reports available, the forest areas and their assets in Manchuria for 1918 may be roughly as follow:—

(a) On the right bank of the Yalu and along the Hun River; 2,004,000,000 *tsubo* with 347,655,000 *koku* of timber, at 520 *koku* per 9,000 *tsubo*.

(b) On the upper parts of the Sungari, the Mutan and the Tumen excluding such localities as have only a few hundred *koku* of timber (according to the investigations of the S. M. R. Co.); 5,892,000,000 *tsubo* with 1,315,519,000 *koku* of timber, at 670 *koku* per 9,000 *tsubo*.

(c) Along the eastern section (between Harbin and Pogranichnaya); 7,305,000,000 *tsubo* with 924,696,000 *koku* of timber, at 380 *koku* per 9,000 *tsubo*.

(d) About Sansing district; 15,873,000,000 *tsubo* with 2,816,602,000 *koku*, at 495 *koku* per 9,000 *tsubo*.

(e) As to the forests in and about the Hingan range, no data can be obtained, except that in the district within the radius of about 30 miles around Horgo and Hingan stations for the centres, the average timber asset is put at about 450 *koku* per 9,000 *tsubo*.

Remarks: 1 *koku* is equivalent to 20 cubic feet.

Timber Industry.—The timber industry of Manchuria and Mongolia may be practically merged into the felling and utilizing of conifers. A great deal is exported to Tientsin as building material, but what is used for making coffins goes up to a considerable amount. As to the utility of broad-leaved trees, they are used for railway sleepers, mine timber and firewood, and for the making of charcoal, and little of them is employed for other industrial purposes. As timber markets, Kirin and Antung come foremost, followed by such consuming centres as Harbin, Changchun, Fengtien (Mukden), Dairen, etc. At Antung the Yalu Timber Company under Sino-Japanese joint management is located. Kirin has been a well-known timber centre from old times. At present there are divers Japanese and Chinese organizations engaged in putting out timber. Next, along the eastern section of the Chinese Eastern Railway, the railway management and Russians and Chinese have had railway sidings built to their lumber yards and are carrying on timber industry, including the operation of saw mills. With regard to transportation, both Kirin and Yalu timbers are carried down the rivers, whilst North Manchurian outputs are transported by railway. North Manchurian timber is usually 21-ft. in length, and Kirin timber is rafted down the stream in logs, the usual lengths being 15-ft. and 24-ft. As regards Antung lumber, ordinarily it is rafted down with two sides thereof stripped of the bark and roughly 16-ft. and 24-ft. lengths are most common.

Timber Dealers.—In Dairen the leading timber dealers include the Mitsui Bussan Kaisha, Ryoto Timber Co., Yamaba Yoko, Dairen Timber Co., Kwantung Timber Co., the branch of the Akita Shokai, etc.

There are at Fengtien (Mukden) the branch of the Yalu Seizai (Saw Mill) Co. that of the Akita Shokai, the Mitsui Timber Yard, etc. The chief dealers at Changchun include the Manchuria Timber Co., Changchun Saw Mill, etc. At Kirin, there are the Mitsui Bussan Kaisha, Kirin Timber Co., the branch of Yalu Saw Mill, etc. At Antung, there are, in addilion to the Yalu Timber Co,, Yalu Saw Mill, East Asia Timber Co., Antung Saw Mill, Antung Timber Co., etc.

Forests and their Political Bearings.—In order to attend to the affairs concerning the forests, the provincial government of Manchuria have each the board of foresty which issues laws, regulations, etc. However, the foresty administration exists only in name, and forest fires, reckless disforesting, illicit disforesting, etc., occur in succession, and the depletion of the forests is growing worse year after year. It is partially because of the inadequacy of the Chinese police force and the bold operations of the brigandage, which render the steady exploitation of the forestry assests impossible. The high taxation in force on the forests, which are looked upon by the government as an elastic source of revenue, is also answerable for the yearly deforestation in a measure.

Apart from the Kwantung leased territory, all along the South Manchuria Railways, the hills have become bared of trees for the most part. This is highly regrettable not only from a forestry point of view, but from several other considerations. Only, it is gratifying to hear that the question of afforestation is beginning to interest the Chinese officialdom and people as well. The South Manchuria Railway Company has been distributing gratis yearly saplings of different kinds to the Chinese applicants.

V. Marine Products

The Kwantung leased territory has only short coast lines. Still the Yellow Sea and the Gulf of Pechili abound in fish of all kinds, and fishery industry is being carried on on an extensive scale. However, outside the Kwantung leased territory, there are no reliable statistics available. The more important kinds of marine products found in the Kwantung coast waters include the following:—

Tai, cod, sword fish, *guchi*, sawara, sole, flounders, *suzuki*, shark, *nibe*, sardines, *shirasu*, cattlefish, octopi, sea-slug, oysters, earfish, prawns, lobsters, crabs, whales, seals, etc.

Fishermen in Kwantung Leased Territory.—The fishermen in the Kwantung leased territory are either Japanese or Chinese. The Japanese fishermen come from such prefectures in Japan as Yehime, Kumamoto, Kagawa, Oita, Hiroshima, Okayama, etc. They usually come over from Japan in spring and go home late in

autumn. There are about 200 odd fishing boats with some 1,500 fishermen, against about 16,000 Chinese fishermen. The chief hauls made by the Japanese are *tai*, and those by the Chinese are cod, *guchi* and swordfish.

The following are the figures for the past three years :—

	lbs.	
1917	25,135,150	Y.1,187,755
1918	25,631,675	1,617,493
1919	26,995,575	2,550,924

The whale-fishery about Haiyangtao Island, near which the naval battle took place in the Sino-Japanese war, is undertaken almost exclusively by the Oriental Whale Fishery Co. Few Chinese are interested therein. The catches are forwarded Shimonoseki way. Seals are captured on the ice-floes when the ice in the coast-waters break up on the return of spring in the north of the Yellow Sea and also in the north of the Gulf of Pechili. The annual hauls range between 700 and 800 head, and sometimes over 1,000 head.

MARINE PRODUCT INDUSTRY.—The marine product industry still toddles in its infancy. Cod, *guchi*, mackerel, *nibe*, flounders, etc., are salted, and sea-slug, ear-fish, jelly-fish, shell-ligament, etc., are subjected to some preservation process by the Chinese. Some Japanese are turning out dried cod, and also working upon *tai* fish, but neither is worth mentioning.

FRESH WATER FISHERY.—The rivers, lakes and other bodies of water inland also abound with fresh water fish.

In the Yalu, the part about Antung affords a good fishing ground. In the Sungari, the parts about Wulakai on the Upper reaches, about Sanchiakou and farther below about Sansing are the most fruitful grounds. The lake in Hulun is one of the newest grounds. Among the fresh water fish, the carp, gibel, trout, salmon, wels, *suzuki*, *tanago*, *yamame*, *higai*, river-shark, etc., may be counted. In summer, the catches are carried to the market, and in winter, they are forwarded even into the interior of Siberia. The main and branch streams of the Sungari are known as pearl grounds, and a good deal is still being put out.

SALT INDUSTRY.—Over the Yellow Sea and the Gulf of Pechili, there is little rain and the evaporation process goes on actively. Therefore, the sea water is brinier, and salt manufacture is conducted very extensively along the sea coasts. Along those of Yingkou, Kaiping and Fuchou, the salt gardens under management of Chinese government and private parties lie in almost an unbroken line. The sea water is put in the salt gardens by making use of the tide and wind-mills, and is left to evaporation by the sun. Salt industry is conducted vigorously also in the Kwantung leased territory. The yearly outputs vary according to years, but are placed at about 3,000,000 *koku*, of which about 700,000 or 800,000 *koku* is put out in the leased territory.

Salt belongs to the monopoly of the Chinese government. The salt monopoly system is not unified all over China, but is more or less different according to provinces. In the three eastern provinces, the system is fashioned much after the Japanese system. The government buys salt manufactured along the sea coasts and sends it to different centres to sell it at the specified price. This system is comparatively well-organized. The import of no salt produced outside Manchuria is permissible into Manchuria. Smuggling is liable to severe punishment. Salt produced in Manchuria is debarred from export, except to Mongolia and the Jehol district. In the Kwantung leased territory, the area suited to salt manufacture is estimated at about 2,400,000 *tsubo*, of which only one-half is now operated. The Japan Salt Manufacturing Co., the Oriental Development Co., etc., are actively interested. When the export of Kwantung salt to Japan and Chosen increases, the outlook of the Kwantung salt industry will appear more promising.

VI. Industry

RAPID GROWTH OF JAPANESE INDUSTRIES.—Manchuria is richly endowed by nature with vast possibilities in agriculture, stock-farming, forestry, mineral products including fuel, and other industrial materials. Still, owing to the infantile stage of the Chinese in industrial or technical lines, there are few industries worthy of the name outside oil-expressing, flour-milling and *samshoo*-distilling. Even as to daily necessaries, the majority of them have had to be imported from abroad or South Manchuria. However, as the sphere of the Japanese activities has expanded in recent years, the abundance of raw materials and fuel (coal) and cheap labor have been turned to most account, and it has resulted in the establishment of a long list of industries, and thus the dawn of an industrial colony seems to be breaking on the Kwantung leased territo?y.

CHEMICAL INDUSTRY.—Chemical industry, because of any supply of coal lying at hand and also because of the cheap electric power from the Mond gas producer plants being available, appears destined to thrive at and about Fushun. Actually, at the sulphate of ammonia factory attached to the Mond gas producer plant under management of the South Manchuria Railway Company, calcium carbide, calcium cyanide, sulphate of ammonia, etc., are being put out in considerable quantities. At Dairen, there are the Electro-Metallurgical Co., Manchuria Barium Industry Co. and Solite Manufacturing Co. (for the manufacture of solite, a paint made from soya beans). At Antung, there is the Manchuria Blasting Powder Factory. It is a pity that, despite the repeated experiments made for the production of soda from the plentiful Kwantung salt, the proposition has not yet assumed a tangible shape. In lines of oil and fat industry, the Dairen Oil & Fat Industry Co. is turning out hardened oil, etc., from soya bean oil, the Manchuria & Mongolia Development Co. dealing in gelatine, animal oils, and vegetable oils. In addition, the Manchuria Paint Co. is also located at Dairen.

MANUFACTURING INDUSTRY.—Bean milling ranks foremost in manufacturing industry. Bean oil is indispensable to the Chinese as a food and for cooking. Bean milling is best developed at Dairen, which is now possessed of sixty mills. In the interior of the country, the old primitive system by which a few head of mules or donkeys and a few hands do the work of expressing oil from beans is still found in vogue. Such is only a domestic by-industry. However, such extensive mills as use steam engines and express oil by hydraulic pressure are mostly found at Dairen. The Suzuki Bean Mill at Dairen is operated on the chemical extraction system which is the latest scientific method. The round-shaped cake left after the expression of oil weighs 46 *kin* a piece, which is the standard weight for export cake. In the fiscal year 1919, 19,693,000 piculs valued at Hk. Tls. 43,029,000 were exported to Japan. Bean meal, which is put out at the Suzuki Mill, is good for use as it is. Bean cake is used by the Chinese for cattle-feed, and by the Japanese as fertilizer. It contains a good percentage of nutriment sufficient to be made a food-stuff, and so the idea of converting bean cake into an article of food should not be pooh-poohed at as a fool's vagary.

The total outputs of the bean mills along the South Manchuria Railways in the fiscal year 1919 are placed at about 1,462,000 tons worth Y.99,800,000 in bean cake, and 151,000 tons worth Y.22,-650,000 in bean oil. Bean oil chiefly serves as material for the making of soap, oleomargarine and paints in the United States. Bean cake is exported principally to Japan. Distilling industry comes next in importance to bean milling in Manchuria. The liquors used by the Chinese in Manchuria are chiefly *samshoo* (distilled from *kaoliang*) and *huangchiu* (fermented from millet). *Samshoo* is the most popular drink and bears a slight resemblance to whisky. Fengtien (Mukden) and Liaoyang and their vicinities are the centres for *samshoo* distillation, although distilleries lie scattered all over the country. The aggregate yearly output of *samshoo* is estimated at Y.13,000,000, and no inconsiderable amount is exported to China. Recently there have been quite a number of people starting the manufacture of *sake* (a Japanese drink fermented from *sake*), *miso* an article of food, a necessary adjunct to breakfast in Japan which is made of beans, salt and *koji* (fermented rice), and *soy*. Japanese-made *soy* is superior to the Chinese-

made article in quality, and is believed to grow in demand amongst the Chinese.

The S. M. R. Co. general laboratory has invented an improved process of fermentation, and also how to manufacture calcium lactate from the grounds of *kaoliang* left after *samshoo* has been distilled.

Next, ceramic industry is still another indigenous enterprise that holds out a good promise. Manchurian soil is suited to ceramic industry. There are the Continenal Ceramic Factory at Fengtien (Mukden), the Asia Ceramic Factory at Kungchuling, the East Asia Brick Kiln at Dairen, and the branch kiln of the Yingkou Brick Kiln at Choushuitzu, in addition to like plants of more or less scale at Anshan, Kaiyuan, Changchun, Antung, Liaoyang, Ryojun (Port Arthur), etc. Most of these put out bricks and fire bricks. There are further numberless Chinese bricks kiln of modest scope.

South Manchuria, especially the Kwantung leased territory, abounds in limestone material for cement. The Onoda Cement Factory and the Dolomite Cement Co. are at Choushuitzu close to Dairen, and also a cement company is at Fengtien (Mukden). These factories have been doing prosperous business as the railway towns along the S. M. M. Co. lines have grown at a good pace.

As plenty of silicious rock is found to be glass-making material, there are at Dairen, in addition to the S. M. R. Co. Ceramic Experimental Institute, the East Asia Glass Factory and the Dairen Glass Co. The utilities of glass and glassware are not yet universally known among the Chinese inhabitants of Manchuria, but their manufacture is promising. For instance, the Ceramic Experimental Institute above mentioned has achieved satisfactory success in the manufacture of windowpanes and hollow ware both in quality and as a business venture, and before long a glass manufacturing company will be organized on an extensive scale under private management. In addition, with the war-time boon in iron foundry business, the Dairen Crucible Manufacturing Co. was brought into being. Then, pottery business is still another line of industry that promises to pay.

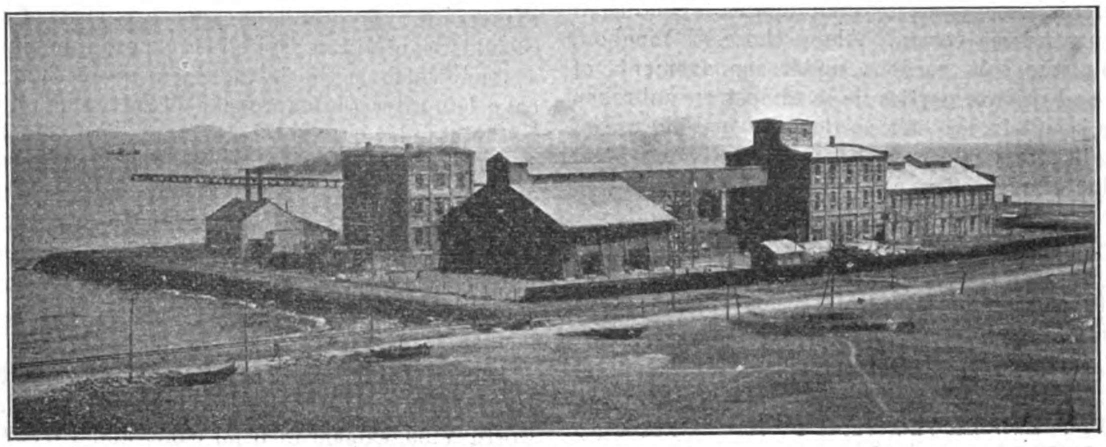
The pottery division which belonged to the Ceramic Experimental Institute was transferred to the China Ceramic Co. on October 1, 1920. Among those engaged in gathering clay and other raw material, there are the Japan-Manchuria Pottery Co., Manchuria Pottery Co., etc. Wulakai in Kirin province has enjoyed the name of a fine pottery centre from old times.

(To be continued.)

SOYA BEAN OIL

By Mr. M. Nakao & Mr. S. Ikebe (of the General Laboratory of the South Manchuria Railway Co.)

BEAN oil is made from soya (Manchurian) beans (glycine hispida maxim) which originated in China and have been transplanted in Japan, Chosen (Korea), India, etc. Manchuria is highly suited to the cultivation of beans, the aggregate production being estimated at between 12,000,000 and 18,000,000 *koku* (1 *koku* is equivalent to 4.96 bushels), of which, half is consumed by the bean mills, and the oil exported. The mills at Dairen consume over 500 tons a day.



South Manchurian Railway's Experimental Bean Mill

Naturally, the study of beans, how to improve their breeds and unify them, and foretell deterioration in quality while in storage are matters of great interest and importance. The authors have been engaged in the study of these problems, but have not yet been able to complete them. The information in this article is only part of the results of their investigations.

Classification of Beans and Bean Oil

The quality of oil depends on the class of beans from which it is made, and also on the process employed. The soya (Manchuria) bean has 214 species, which may be grouped under the following heads :—

Hairy: Hairless: (1) Flat, (2) Roundish, (*a*) Yellow, (*b*) Green, (*c*) Black, (*d*) Brown, (*e*) Greenish-Yellow, (*f*) Spotted.

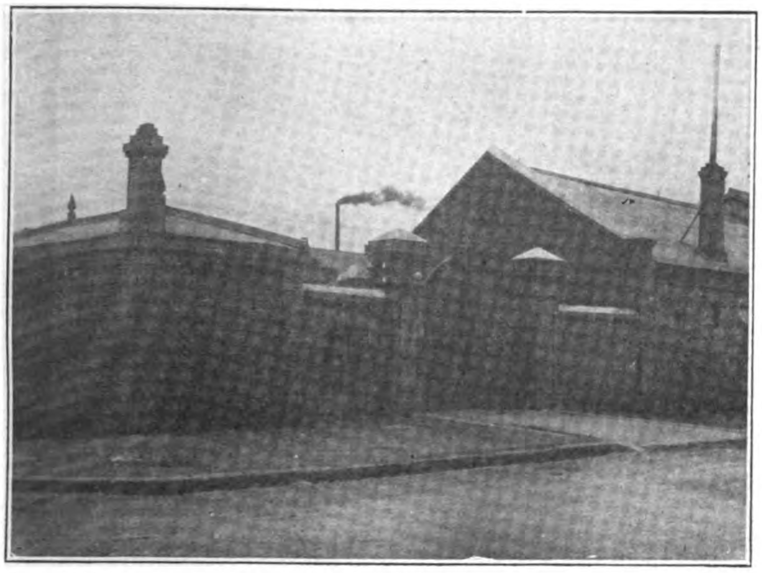
These may be classified according to colors and ingredients and tabulated according to analysis, as follows :

	Oil	Albumen
Deep blue	19.20%	45.55%
Blue	18.79%	43.13%
Light bluish yellow	20.81%	40.25%
Bluish yellow	19.95%	40.45%
Yellow	19.88%	42.54%
Whitish yellow	19.93%	41.81%

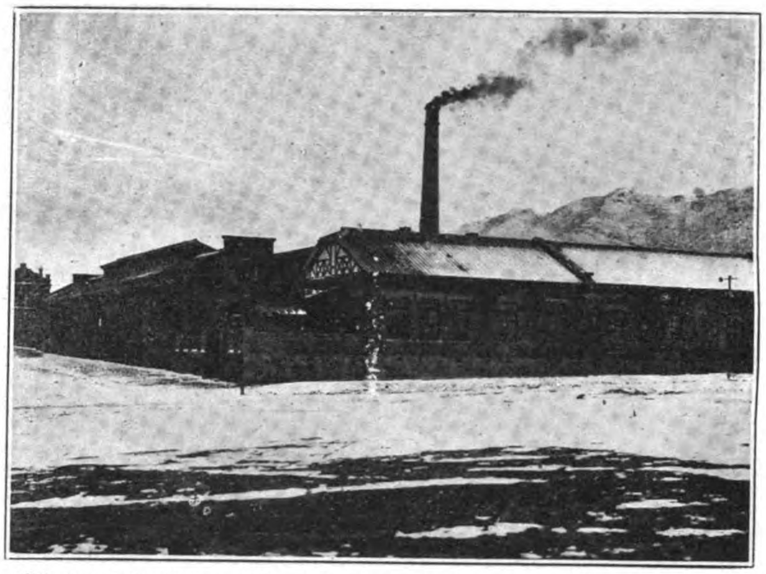
The above will show that the light bluish yellow kind contains the highest percentage of oil, and the blue the lowest percentage. All the yellowish kinds have much the same percentage of oil. Again, the results of analyses of various kinds of Manchurian beans confirm the above table in showing that the yellowish varieties contain the highest percentage of oil, blue a lower percentage, and the black, the lowest percentage. Allowances must be made for more or less variation according to places of production and in time of analysis. However, generally speaking, the yellowish varieties are the commonest and yield the greatest percentage of oil.

The results of the analysis are as under :—

Beans .	Moisture	Crude albumen	Crude fat	Hydrocarbon	Crude fibre	Ash
Whiteeyed ..	9.87	37.23	9.37	24.03	5.11	4.39
,, ..	12.34	37.35	17.59	23.36	5.12	4.36
Chinyuan ..	9.70	37.74	19.33	24.41	5.05	4.77
Blackeyed ..	10.90	37.51	19.64	23.12	5.11	4.53
Yellow ..	9.11	39.90	17.59	24.27	4.92	4.21
Blue	12.64	36.47	16.23	25.08	4.89	4.69
Black . ..	10.74	35.32	15.80	24.43	5.96	4.00



Kodera Bean Mill, Dairen



Works of the Dairen Oil and Fat Industry Company at Dairen, where the oil is hardened, and glycerine, etc., manufactured

Expression of Oil and Bean Oil

Bean oil was formerly used as a source of light and a greater portion mixed with sesamum oil for cooking purposes. In such times, native mills on small scale could fill the local wants. But, since the utilization of bean cake as fertilizer, the bean mills manufactured the cake as the primary object, the oil being a mere by-product. However, as bean oil found an extensive market in Europe and America, the oil and the cake have now an almost equal demand. The process of expressing oil consists in expression and in extraction.

I. Expression

Oil expression may be subdivided into the wedge, the screw and the hydraulic pressure system.

(*a*) Wedge Method: The wedge method has been in use in China from early times. A wedge is employed to express the oil by hand, very primitive, and takes a long time. It is said that by this method, a comparatively large quantity of oil containing a less quantity of impurities is obtained. (*b*) Screw Method: In this method, the screw takes the place of the wedge to save labor. (*c*) Hydraulic Pressure System: The hydraulic pressure system is the most advanced of all and mills operated on this system are on the increase.

II Extraction Method

In the extraction method, a solvent is used for the extraction of oil from beans. By this method, the largest percentage of oil is obtained. However, the oil procured by this system is of a different color from what is obtained by expression, and is dealt in separately. The extraction process extracts almost the whole of oil, whilst the expression process leaves nearly half the oil in the cake. The following table will be of some interest:—

Shape Principal Mills	Bean Cake round Everywhere in Manchuria	Bean Plate oblong Kabalkin Mill, Harbin	Bean Meal in meal Suzuki Mill, Dairen
Maximum pressure per square inch of surface	600-700-lbs.	1,700,2,200-lbs.	By benzine extraction
Oil percentage to beans ..	9-10%	11.5-12.5%	14-15 %
Oil left in residue	7-9%	5-7%	2.5-3.0%
Moisture contained in residue	12-19%	10-13%	4-13%

Literature on Bean Oil (Produced in Manchuria)

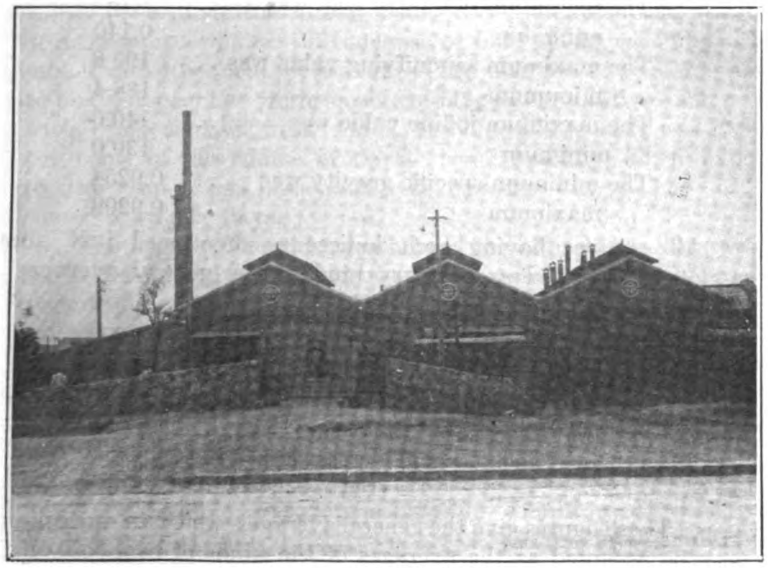
The study of bean oil has become popular with the increase in demand. There are a good number of books and articles written on this subject, giving the results of investigations made into the composition of beans and also their utilities. The following is a list of some of the more interesting writings on bean oil:—

Tsujimoto (in Vol. VII of 1904, Report of Industrial Chemical Society.)

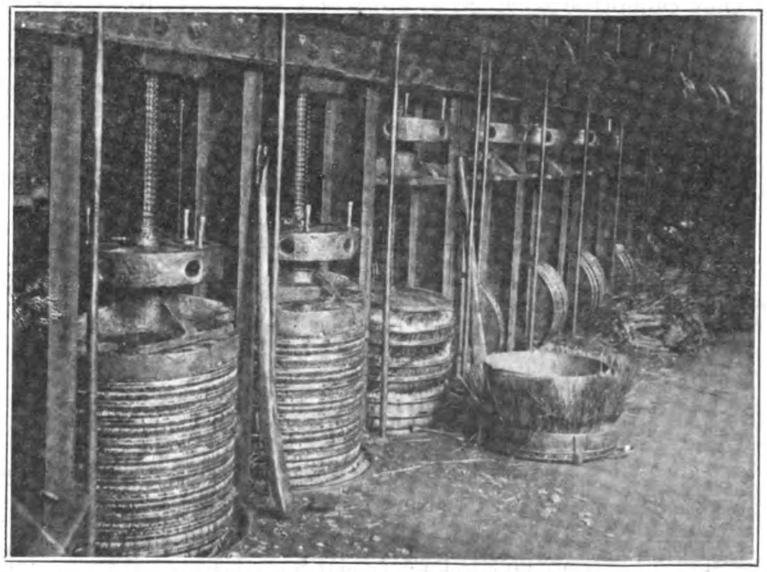
Kametaka (in Vol. XXVII of 1906, Report of Tokyo Chemical Society.)

Nishiyama (in Vol. XI of 1908, Report of Industrial Chemical Society.)

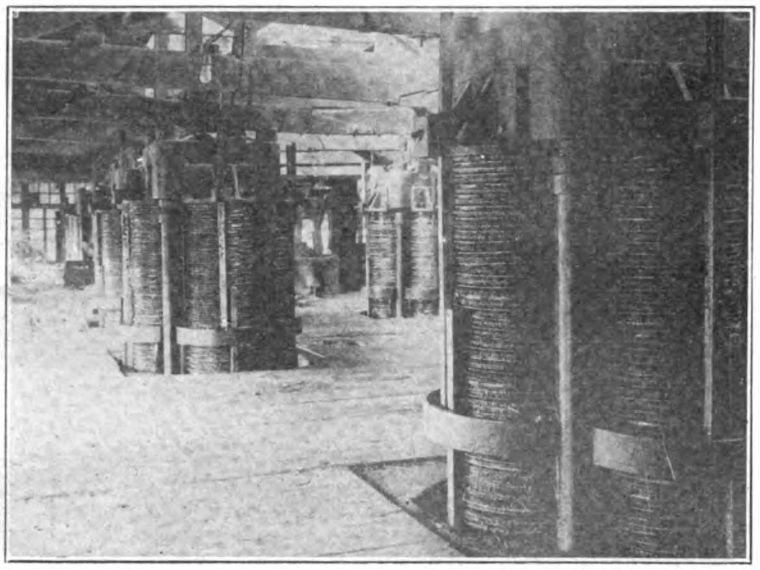
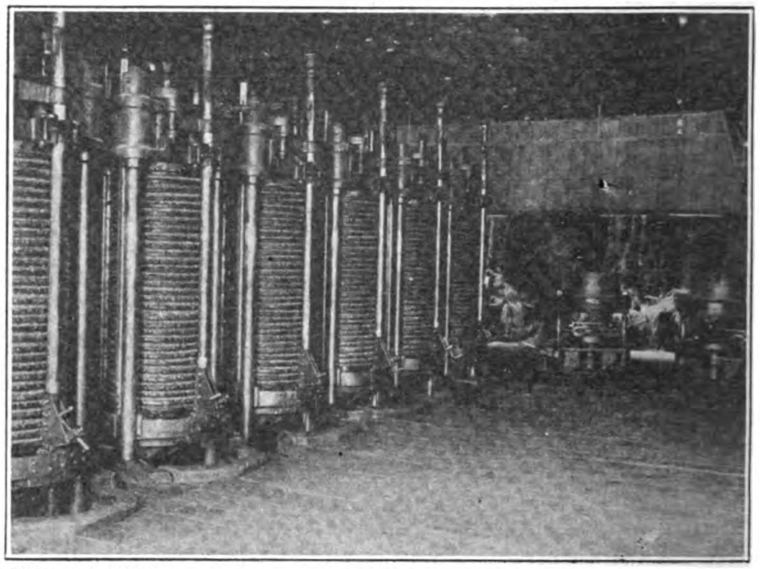
Uyehata (in No. 1, 1910, Report of S. M. R. Co. Central Laboratory.)



Nisshin Oil Mill, Dairen



Interior of the Nisshin Oil Mill, Dairen

Interior of the Santai Bean Mill, Dairen

Keimatsu (in Chem. Zeit, 1911, 8, 39.)
Okada (in Vol. 1, 1913, Report of S. M. R. Co. Central Laboratory.)
Nishiyori (in Vol. V, 1916, Report of S. M. R. Co. Central Laboratory.)
Sato (in Report of Industrial Chemical Society, 1919.)
Tanaka (in Report of Industrial Chemical Society, 1919.)
Uyeno (in No. 9, Report of Industrial Experimental Institute.)
Morawski and Stingl, De Negri, Fabris, and Schukoff.
W. Korentsehewski and Zimmermann ; Chem. Zeit. 1905.
Meister ; Chem. Rev. 1910.
C. Oettinger and F. Buchta ; Zeit. & Augen. Chem. 1911.
H. Matthes and A. Dahl : Tourn. Soe. Chem. Ind. 1911.
L. Settimi. Aun. Leb. Gebella, 1912-1913.
Brightmann ; Jon. Soe. Chem. Ind. 1919.
Charter A. Newhall ; J. Ind. Eng. Chem. 1920, etc.

In the above works and articles, Matthes and Dahl say that bean oil contains 94.95 per cent. of fatty acid ester, of which about 15 per cent. is saturated fatty acid, and about 80 per cent. unsaturated fatty acid. Olein acid takes up 70 per cent. ; linolic acid 20 per cent. ; and linolenic 6 per cent. Nishiyama claims that the unsaturated acid contains hypogene acid. Keimatsu says the presence of linolenic acid cannot be established. Tsujimoto doubts the presence of hypogene acid. Of bean oil, the percentage of non-saponifiable matter seems to widely vary according to places of production and oil-expressing methods. Dr. Riegel says that 0.15 per cent. of lechchin is contained. We have quoted above only a few fragments of the results of the ingredients of bean oil. They cannot be accepted as applicable to the quality of bean oil produced in Manchuria. Especially, as to the indices ascribed to Manchurian (soya) bean oil, opinions have differed. The indices given by Mr. Uyehata finds disagreement. Messrs Tsujimo and Mitsumaru aver that the value of Manchurian bean oil has been set too high.

The following is a table indicating the indices of the respective authors including our own :—

	Tsujimoto (15°)	Nishiyama (15.5°)	Keimatsu (15°)	Morawski & Stingl (15°)	DeNegri & Fabris (15°)
Specific gravity ..	0.9256	0.9242	0.9265	0.9270	0.9242
Freezing point ..	—	17° below zero	15°-16° below zero	—	8°-15° below zero
Saponifying value ..	192.6	192.4	190.0	192.9	192.5
Iodine value ..	132.5	134.4	132-135	122.0	121.3
Hehner value ..	95.7	95.1	94.2	95.5	—
Reichert Meissl value	7.29	0.55	—	—	—
	—	96.0	—	—	59.0
Refractive value ..	20° 1.4755	20° 1.474	Viscosity 9.0 Engler degree	—	—
Butter refractometer	20° 75.2	—	—	—	—

	Oettinger & Buchta 15°	Mathes & Dahl 15°	Authors 15°	Authors 15°	Authors 15°	Authors 15°
Specific gravity	0.9246	0.9240	0.9279	0.9289	0.9267	0.9278
Freezing point	8°–16° below zero	11.5° below zero	—	—	—	—
Saponifying value	192.4-194.0	192.3	190.0	191.0	192.3	190.8
Iodine value	132.9–135.0	131.3	131.8 Wijs method	132.0	137.7	134.8
Hehner value	95.8–96.0	94.07	—	—	—	—
Reichert Meissl value	0.45-0.59	Acid value 0.75	Acid value 0.57	Acidvalue 0.72	Acidvalue 0.18	Acid value 0.09
	—	—	—	—	—	—
Refractive value	(20°) 1.47	—	Viscosity (Redwood) degree 274 (25°)	Viscosity (Redwood) degree 274 (25°)	Viscosity (Engler) degree 8.43 (25°)	Viscosity (Engler) degree 8.26 (25°)
	50-1.4755	—				
Butter refractometer	—	—	72.5	72.5	71.8	71.8

The indices given in the above table have been obtained from only a few samples employed for experimental tests and furnish only a general idea. On this account, they are felt to be somewhat inadequate for all the varieties of Manchurian bean oil appearing on the market. Accordingly, in March, 1921, of three hundred odd bean mills at Dairen and along the South Manchuria Railways, 140 of the more important mills were selected, and samples of ordinary bean oil put by these plants were procured and subjected to a general test, particular attention being given to the color of the oil, which had hitherto been left neglected. This was done, because as an article of merchandise, the color standard must be observed, apart from the uniformity of quality from a chemical standpoint. Especially, in the tests to be passed on bean oil imported into America, its color forms an item of importance. It is laid down that no bean oil shall be darker, when 5¼-in. deep, than the mixture of either yellow (70) and red (8.0) or yellow (70) and red (9.0) of the standard colored glass. Bean oil manufactured in Manchuria seldom meets the above standard requirements. This point is held by us as one which calls for the serious study of the bean mill owners.

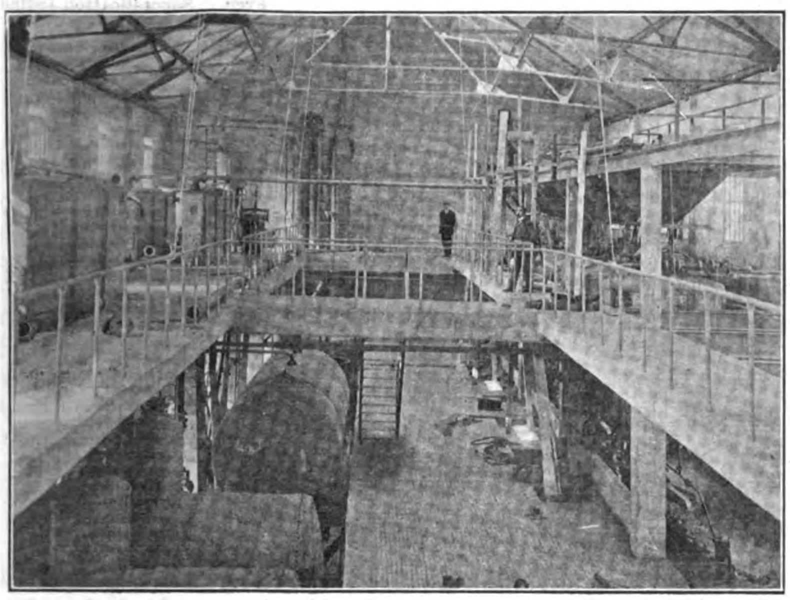
As a result of these exhaustive tests the following data was obtained :—

The maximum free fatty acid was	..	2.782
,, minimum ,,	..	0.140
The maximum saponifying value was	..	195.8
,, minumum ,,	..	188.4
The maximum iodine value was	..	140.0
,, minimum ,,	..	130.0
The minimum specific gravity was	..	0.9254
,, maximum ,,	..	0.9299

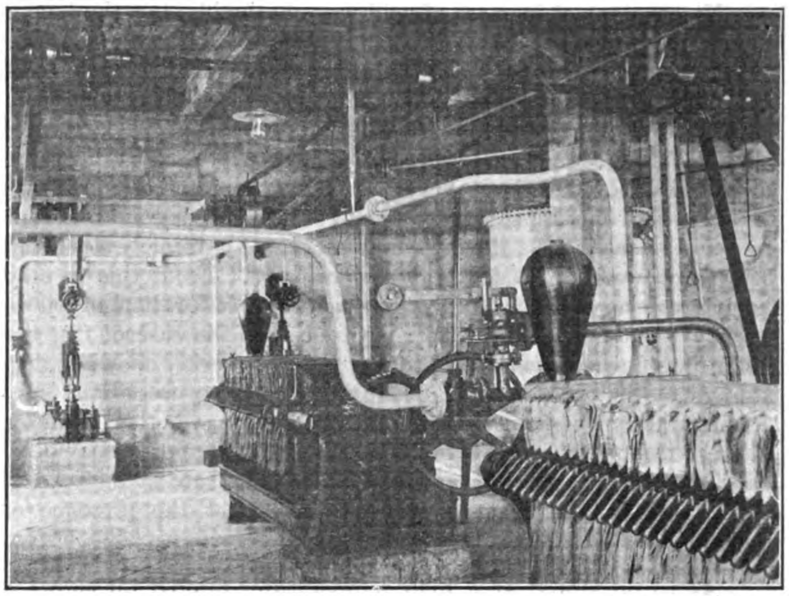
All samples having such indices as mentioned just above cannot be regarded as ordinary kinds. The general averages of all the samples are as under :—

Specific gravity	..	0.9272
Free fatty acid	..	0.4011
Saponifying value	..	191.40
Iodine value	..	134.44
Colour (2 inches deep) ; yellow ..	..	59.18
red ..	..	6.85

These figures give the general averages, which, in our opinion, may be accepted as the averages of the kinds of bean oil on the market. As to the color standards laid down by the United



Interior View of Extraction Room



The Fitter Presses

States, they seem rather severe for the bean oil now on the market, and appear more worthy of refined oil. In fact, if more than two inches deep, the American color standards would seem too dark.

Free Fatty Acid of Bean Oil

Free fatty acid in bean oil is looked upon as important as color, as the percentage of free fatty acid influences the price. Especially, which oil for export, the percentage of free fatty acid is feared to be prone to increase while in transit. Of course, the acid value of bean oil varies according to new or old beans, from which it has been made, and also according to the length of time that has elapsed after its manufacture. The older the beans the higher the acid value. Messrs. Mathes and Dahl say (in Arch. Pa rm. 1911, 249. 424-435) that experience has taught that the moisture in the atmosphere raises the acid value.

Again, Mr. Nishiyama says, in No. 11 of the report of the Industrial Chemical Society in 1908, that exposure to the sun is found to increase the acid value of bean oil. The same author calculates the rate of increase as: 0.55 per cent. of acid value in bean oil rises to 1.01 per cent. on exposure to the sun for thirty days, and to 4.63 per cent. after ninety days. The same author has then studied if the acid value increases or not because of the presence of residue in bean oil, and has learned that such presence produces little effect. According to a report prepared in April, 1921, by the Kobe branch of the Mitsui Bussan Kaisha on the cause of deterioration of bean oil in quality, firstly, a sample of bean oil adulterated with 1 per cent. of impurity showed that the acid increased by 1.5944 per cent. in the course of fifty days, and also that the rate of increase rose higher till the lapse of forty days; secondly, when mixed with 1 per cent. of sea water, the increase of acid was noted to be 0.479 per cent. in the course of fifty days; thirdly, when mixed with 1 per cent. of fresh water, the increase of acid was 0.3948 per cent. in the course of thirty days; fourthly, when exposed to the sun, the percentage of increase was 0.1128 in the course of twenty days.

The degree of acidification among the above four cases was in the order mentioned, and in the fourth case, but little effect was discernible. The authors subjected samples of bean oil manufactured afresh at the factory of the Dairen Oil & Fat Industry Co., Dairen, the qualifications of which were as follow, to the undermentioned tests: Specific gravity 0.92 at 15° C; free fatty acid 0.143 per cent.; saponification value, 190.7; iodine value 132.2; moisture, 0.173 per cent. When oil is filtered, free fatty acid is put at 0.14 per cent.

These samples were left in different conditions as designated on the next column for thirteen weeks, the free fatty acid having been examined and measured once a week in the meantime.

	Maximum free fatty acid	Rate of increased acid	Progress
Crude oil (2 litres) (Stored in the dark)	0.1936	3.68	No increase of acid noticed after the fifth week.
Filtered oil (2 litres) (Stored in the dark)	0.1936	3.68	,, ,,
Crude oil (exposed to the sun)	0.2079	4.93	The weather conditions prevented a regular examination and measurement, but after the tenth week, no increase of acid was observed.
Crude oil (500 c.c.) (Stored in exsiccator)	0.1798	2.84	Acid increased very slowly, ceasing to increase after the ninth week.
Filtered oil (500 c.c.) (Stored in exsiccator)	0.1798	2.84	,, ,,
Crude oil (500 c.c.) (Stored in exsiccator saturated with moisture)	0.2628	8.79	From about the fourth week, the oil began to thicken from the surface; this became more pronounced in the thirteenth week, the increase of acid going on incessantly.
Filtered oil (500 c.c.) (Stored in exsiccator saturated with moisture)	0.2766	9.41	As above mentioned.
Crude oil (2 litres) (Stored in a heated room from 50 c to to 60 c)	0.3100	12.16	In a day, most of the precipitation became dissolved, the oil turning clear; the constant restored after three weeks.
Filtered oil (2 litres) (Stored in a heated room from 50 c to 60 c)	o.2766	9.41	No increase of acid observed after three weeks.
When dry air was sent in	0.1936	3.68	Little change noticed; the constant restored after four weeks.

As regards the variation in the increase of acid when oil is kept at a high temperature, the oil was kept in a drier at 105° C. for different lengths of time, and the free fatty acid was examined and measured, the results being as follow:

Left for	Free fatty acid: At beginning	At end	Rate of increase of acid to its inherent acid
2 hours	0.163	0.166	0.19
,, ...	0.164	0.174	0.59
4 hours	0.140	0.194	3.86
,, ...	0.163	0.102	2.39
,, ...	0.164	0.205	2.5
,, ...	0.140	0.166	1.8
12 hours	0.143	0.286	10.0
,, ...	0.183	0.302	6.7

No constant of increase of acid was obtainable, but the longer the oil under test was allowed to stand, the greater was the increase of the free fatty acid. It will be noted from the above results of the tests that (1) when either crude oil or filtered oil is kept from contact with air as far as possible, for instance, in an exsiccator, the rate of increase of acid was not marked; (2) the rate of increase of acid was comparatively low also when crude or filtered oil was kept in the dark; (3) the same held true when dry air was sent in. In the case of (1), the increase of acid was extremely slow, and after nine weeks, the constant was restored. From this it may be inferred as effective in preventing the deterioration of oil in quality to minimize its contact with air. In the case of (2), the quantity of acid became constant after five weeks, showing that storage in the dark is more desirable than exposure to the sun. Again, when oil is kept in a humid atmosphere, whether crude or filtered, the oil will absorb the mositure with more or less avidity, causing the oil to thicken and also raising the rate of increase of acid. It is patent what a deteriorating effect the presence of moisture has on the quality of oil.

As to oil stored at a high temperature, filtered oil shows a smaller rate of increase of acid, compared with crude oil. Still, the rate of increase is unmistakably higher than in other conditions. Such a contrast is all the more striking according to the lengths of time kept at a temperature above 100° C. These are phenomena resulting from the dissolution of oil, and it deserves special notice that the process of dissolution goes on more rapidly in water of normal temperature. Next, any impurity contained in crude oil, how small it may be in quantity, when it acts catalytically, was considered as a cause of the increase of free fatty acid, and some crude oil with all its impurities and some filtered oil were left untouched for a long time, to determine their respective acid values.

The above mentioned both samples were stored in the dark, and if any precipitation was found to settle, it was shaken well, and then a sample was obtained for examination and measuring.

	Free fatty acid In crude oil	Free fatty acid In filtered oil	Rate of acid value
At beginning ..	0.2484	0.2000	1.5 : 1
After 4 weeks ..	0.4703	0.2143	2.2 : 1
After 8 weeks ..	0.8783	0.2282	3.9 : 1
After 12 weeks ..	1.1756	0.2351	4.9 : 1

According to the above, oil, when once filtered, compared with crude oil, shows little increase in the free fatty acid. On the contrary, in the case of crude oil, at the end of 12 weeks, the quantity of acid is found to rise to fivefold, perhaps due to a catalytic solution. For this reason, when bean oil is to be stored in a large quantity for a long period, it ought first to be cleared of what impurities are contained by filtering.

Moisture and Bean Oil

We have learned by experiment that the dry air affects bean oil just a little, and that the moist atmosphere is prone to cause deterioration in the quality of bean oil. Again, we have brought some bean oil on sale on the market into contact with dry air after the oil has been filtered, and also into contact with moist air after letting the air pass through water. These experiments have been conducted in order to see what effect, if any at all, may have been produced on the saponification value and also iodine value.

It has been found that dry air does not cause any change in the oil, while, on the contrary, moist air increases the acid value, causes the oil to thicken in the fourth week, makes it more turbid in the fifth week, cause it to emit an acidifying smell like the odour of bird-lime and increases the settlings from the seventh week, and in the tenth week, the decomposing process goes on so actively as to make it difficult to obtain any two samples of the same quality.

	Moisture	Free fatty acid	Saponification value	Iodine value
Bean Oil	0.141	0.4426	190.8	134.3
After dry air has been sent in for five weeks	0.141	0.4426	190.2	134.3
After moist air has been sent in for a week	0.3360	.4444	193.4	133.4
After moist air has been sent in for five weeks	0.345	0.5255	191.4	131.2
After moist air has been sent in for ten weeks	0.606	0.6274	190.3	132.2

The indices for the samples of bean oil subjected to the test are as under :—

	Saponification value	
At beginning	191.0	132.7
Stored in the dark	190.8	132.8
Stored in dry air	191.0	132.6
Stored in saturated moisture ..	191.2	135.0
Stored in hot air	191.0	133.2
When dry air is sent in . ..	190.7	132.5

From the above, the saponification value of bean oil is affected but little in case of an increase of acid being noted or otherwise. On the other hand, on the whole, the value is observed to increase when the oil under test is subjected to a high temperature or is brought to contact with moisture. These results contradict the conclusion drawn by Messrs. Mathes and Dahl who say from experiments that moist air always lowers the iodine value. This point awaits further investigation.

Receptacles and Bean Oil

Nothing has yet been said about the effect of the receptacle, in which bean oil is packed, on the appearance of the contents.

However, when bean oil is kept in a glass vessel, which is liable to generate alkali by solution, the free fatty acid is known to decrease in value when left therein for some time from the original quantity.

Next, some kinds of receptacles get eroded through the impurities in the oil, threatening at times to deteriorate the quality of the oil. In our cases, the samples have been obtained from bean oil on the local market, packed in oil tins. In order to ascertain whether or not any change will take place in the amount of the free fatty acid, when stored in a glass bottle and also in a tin can, the oil in the two different kinds of receptacles has been left to stand for eleven weeks, but no change has been indicated in the amount of fatty acid, as shown under :—

	In glass bottle (1 litre)	In tin can (about 1 litre)
Free fatty acid at beginning ..	0.4986	0.4986
After one week	0.4979	0.4979
After five weeks	0.4978	0.4978
After ten weeks	0.4978	0.4978

Next, 1 litre of ordinary bean oil on the market has been put in three different kinds of receptacles (A) a galvanized metallic vessel, (B) a vessel made of iron plate, and (C) a vessel made of tinplate. At the close of each week succeeding, the oil has been examined, giving the following data :--

	Free fatty acid	Saponification value	Iodine value	Ash	Remarks
At beginning	0.7449	191.9	132.9	0.039	Moisture 0.107 : Specinc gravity 0.9264
At end of 1st week ..	0.7746	—	—	—	
Vessel A	0.9192	190.9	131.8	0.04	No special metallic reaction shown in ash
Vessel B	0.7606	190.3	132.6	0.035	,,
Vessel C	0.7746	190.3	132.7	0.04	,,
At end of 2nd week ..	0.7883	—	—	—	
A	0.6777	190.8	132.3	0.04	,,
B	0.7381	189.6	132.9	0.04	,,
C	0.7883	190.8	131.5	0.04	,,
At end of 3rd week ..	0.8460	—	—	—	
A	0.6912	190.4	132.3	0.045	,,
B	0.7380	190.1	132.0	0.038	,,
C	0.8022	191.8	132.3	0.040	,,
At end of 4th week ..	0.8714	—	—	—	
A	0.6569	190.7	132.3	0.048	No special metallic reaction shown in ash. Specific gravity, 0.9264
B	0.7469	191.9	132.8	0.04	,,
C	0.8443	191.9	132.1	0.039	,,

In the above tests, the bean oil used as standard showed an increase in free fatty acid from 0.7449 per cent. at the beginning to 0.8714 per cent. at the close of the fourth week.

Next, looking over the samples of bean oil kept in the three different kinds —A, B, and C—the contents of A indicated a decrease in free fatty acid ; those of B gave a like result ; and, as to those of C, no change was observed. In the case of A (a vessel made of galvanized metal), the surface was noticed to come off gradually as weeks went by, producing a precipitation, chiefly zinc. This decrease of the acid value, as instanced in the above table, is now under investigation. It is perhaps due to the fact that the free fatty acid has combined with the metal dissolved by electricity and has formed a salt. In fact, the coming off of the zinc seems to bear out such theory. Especially, the change of color of bean oil is more notable, as is denoted under :—

Bean Oil, 2 inches deep, measured by the Robibont Tintmeter

	A (galvanized metal)		B (iron plate)		C (tin plate)	
Standard glass	Yellow	Red	Yellow	Red	Yellow	Red
Bean Oil for test ..	61.2	7.0	61.2	7.0	61.2	7.0
At end of 1st week ..	62.2	7.0	81.4	4.6	57.5	6.8
2nd ,, ..	64.1	6.6	110.4	1.3	60.5	6.8
3rd ,, ..	62.2	6.5	118.0	1.6	60.2	6.6
4th ,, ..	62.2	6.5	120.2	1.6	57.8	6.6

It must be noted that the above data have been obtained as the result of only one experiment, whilst further experiments ought to be conducted to confirm the same. In the cases of A and C, little change has been observed, a tendency of fading even being noticed. On the other hand, with B, the color has been found to darken perceptibly.

Precipitations and Bean Oil

It is well known that the storage of bean oil expressed afresh produces a precipitation. In ordinary circumstances, the precipitation is put at 1 per cent. of the storage amount. We left bean oil just expressed in a long glass tube. The floating matter was slow to settle, and it took about four weeks for it to get practically precipitated, and, at the close of the fifth week, the oil became a clear liquid of uniform color. The settlings amounted to 1.26 er cent. of the dimensions of the oil, and, if dried, they were found to be 0.09. When the oil is freed from the settlings, no further precipitation is formed unless the oil contains water or other impurities.

The settlings have been obtained from the Nisshin Oil Mills, Ltd., Dairen (Mr. J. Furusawa, managing director) and been subjected to analysis, the results of which being as follow :—

Water	14.05
Ether lixivium	46.98
Crude albumen	2.75
Other organic matters	32.65
Ash	3.57

In order to neutralize 10 grammes of bean oil, 9.96 grammes of caustic potash is required. If this is included in the calculation as olein acid, the oil amounts to 50.18. About half the settlings consists of fatty acid ; the other half consists of water, minerals, albumen and other impurities, which make factors to lower the quality of bean oil. As already stated bean oil, when filtered and free from the settlings, is less liable to get deteriorated than crude, oil, and on this account, for the storage of bean oil, the removal of these settlings is necessary.

Conclusion

We may add that the 140 samples of bean oil, above mentioned were obtained from the bean mills without the mixture of any other substance. However, there were sixteen kinds suspected of the mixture of some blue bean oil.

The results of gaging by the tintmeter are as follow :

	Blue bean oil		Ordinary bean oil	
	Yellow	Red	Yellow	Red
Maximum ..	187.5	8.6	55.0 or 91.5	12.0 or 8.8
Minimum ..	109.0	1.6	23.0	5.75
Average ..	106.8	4.4	59.18	6.85

The above table will serve as guide to deciding whether or not a sample of bean oil is an ordinary kind or blue bean oil. In the case of an ordinary kind, the yellow seldom rises above 70. What is near 100 may be regarded as an inferior kind and wears a dark color.

As to the chemical indices, such as denoting :—

Specific gravity	0.9272
Free fatty acid	0.4011
Saponification value	191.04
Iodine value	134.44

may be accepted as ordinary kinds.

In bean oil, the free fatty acid markedly increases to the end of the fifth week after its expression, but thereafter the rate of increase is observed to be very slow except under special circumstances. The chief factors of the increase of the free acid are moisture, a high temperature and precipitates. Bean oil which has been eliminated of these impurities shows a less marked change.

Speaking of the receptacles, in which bean oil is to be packed, some of them will cause more or less discoloration. An iron vessel, which is rusty, is the worst and should be carefully avoided. When bean oil is to be stored in a large quantity, care should be given what kinds of vessels they are to be kept in. Next, the removal of all impurities and water is the most important. In conclusion, we are pursuing our experimental study of bean oil and also how to decolorize blue bean oil or such as has some of it mixed, and also how reduce the acid value of such as has an excess amount of free fatty acid, and we may have an opportunity to publish the results of our further investigations.

Japan's Condensed Milk Industry

THE condensed milk industry in Japan, like so many other enterprises which found their reason for being in the prosperity of the war period, fell into evil days after the armistice and has as yet been unable to recover from its difficulties.

Before the war the condensed milk industry in Japan was very insignificant. Naturally so, because, there were very few cows to supply any reasonably adequate quantity of milk for the factories. The greatest part of the condensed milk used in Japan came from Europe and America, only 30 per cent. of the consumption being produced in the domestic factories.

Shortly after the war began, imports fell off and demand increased abroad. In order to build up the primitive industry the government granted many exemptions from taxation to condensed milk companies. In 1915 and 1916, therefore, it began to grow, and in 1920 there were more than 30 factories in Japan.

Comparatively Great

Even at the height of the war prosperity production was insignificant compared to the European or American industry, but considering Japan's lack of pasture grass, and milch cows, it was comparatively great.

In 1912 production was 2,113,290 *kin*, growing as follows : 1914, 3,188,587 *kin* ; 1917, 7,538,560 *kin* ; 1918, 10,821,043 *kin* and 1919, 16,902,994 *kin*.

From 1914 to 1919 the increase was five-fold, but from 1920 business has fallen off, and production consequently decreased and the future prosperity of the whole industry is extremely problematic.

Assisted Greatly

Only under the beneficient shade of the great war and by means of government protection was it possible to develop this industry to its past greatness. The government put an import

tax on foreign condensed milks of Y.5.50 per 100 *kin*, rescinded the domestic consumption tax on sugar, on all sugar used in condensed milk manufacture, and for three years from the date of establishment of a condensed milk company exemption from all taxation was granted. All these governmental aids were necessary to start the manufacture even, and it cannot be wondered at that its foundation is therefore decidedly weak.

Thirty Companies Now

To-day there are 30 companies engaged in producing condensed milk but their combined capital is not more than Y.5,000,000. Three companies, the Toyo Condensed Milk Co., capitalized at Y.1,500,000, the Kona Milk Co., Y.1,000,000, and the Boso Condensed Milk Co., Y.1,100,000, account for the greater part of this total. All the other companies are small, T.50,000 being a large capital for any one of them. It can readily be understood therefore that the equipment of these factories is decidedly inadequate and production can only be on a very small scale.

Each of these petty companies has registered dozens of trademarks and consequently there are many competing brands of condensed milk on the market for the limited domestic trade.

Double Competition

Not only is there cut-throat competition in buying but the principal raw material, milk, is extremely limited in quantity, so they are all competing against each other to get supplies on which tocontinue production. So the price of milk is driven up, and naturally their products must be sold at high prices.

Manufacturers of condensed milk proudly say that they are making very good condensed milk indeed, and that imported milks will soon be driven off the market by their efforts, but even at the time when foreign milk was most scarce in the domestic market, Eagle Brand (American), and Nestle's brands (Swiss) were not driven out by the home-made product.

Imports Resumed

Since the peace released European and American condensed milks for export, Japan has been importing more and more of them every year. The quality of the European and American manufactures is unquestioned abroad, while Japanese condensed milk exported during the war earned a poor name, and there is no market abroad now open to it.

Comparative Figures

Imports and Exports of Condensed Milk were as follows :

	Imports *kin*	Exports *kin*
1913	6,969,482	——
1918	3,233,976	1,307,350
1919	4,060,950	4,701,388
1920	4,701,388	——
1921, end June..	3,073,388	54,838

In 1920, from January to June inclusive, imports were 2,158,188 *kin*, and in 1919 during the same period they were 2,291,627 *kin*. It can be seen how imports have increased this year.

It can readily be seen that competition with American and European brands has dealt a terrible blow to the Japanese industry. Certainly the Japanese manufacturers cannot continue to produce as they have in the past, especially as now selling competition is getting worse and worse in the extremely limited home market, and export is dead.

Dividends Disappear

The profits of companies is getting lower and lower. The Toyo Condensed Milk Co. was organized especially to manufacture for export. At the height of its prosperity it made only Y.100,000 profit and the highest dividend it paid was 10 per cent. At the end of October 1920 there was no dividend declared and since that time things have been getting worse.

The Nippon Kona Milk Co. began business in 1917. It earned profits of Y. 80,000 at the height of its prosperity and paid a dividend of 8 per cent. The special production of this company is powdered milk. This is now coming from England, and the Japanese manufacture simply cannot compete with it in quality nor in price. Since last year the industry has shrunk to nothing, and most companies have closed their factories. Other companies have amalgamated their interests, while others are having their business adjusted.

Proper Moves

The Boso Condensed Milk Co. has been amalgamated with the Tokyo Kashi Co., under the name of the Nihon Condensed Milk Co., with a capital of Y.300,000. The Tokyo Condensed Milk Co., with a capital of Y.50,000, was amalgamated with the Morinaga Candy Co. These amalgamations are all movements in the right direction, but there are still many small companies in the business, and they are much upset about their future in the face of these amalgamations of bigger interests. It is thought they should all amalgamate into one company, decrease their expenses and improve their product, as well as labor for an improvement of dairying conditions in Japan. The manufacturers themselves look at their future in somewhat this same light, but unfortunately not all of them can be made to see the light of reason, so they go on competing in a ruinous manner, and are thus hastening the complete destruction of their industry.

German Activity in the N.E.I.

THE Germans have been successful in gaining contracts for locomotives, rolling stock, electrical plant, water pipes and bridgework in the Dutch East Indies. Owing to the depreciation of the mark valuable orders have gone to Berlin, and further important contracts are likely to follow if Herr Stinnes succeeds in his schemes for the financial penetration of the islands.

In view, however, of the close watch that merchants and contractors in Holland are keeping on prospective business in the Dutch East Indies, it is probable that the conditions under which Herr Stinnes offers loans for purposes of development there will be scrutinized carefully before acceptance. It will be remembered that he offered to advance £10,000,000 gold on condition that the authorities placed their 1922 contracts with the Rhine Elbe Union. In financial circles it is now reported that the sum offered has been increased to £30,000,000 gold.

Another offer by Herr Stinnes was that of a loan of several million florins to the municipality of Bandoeng, the stipulation being made that all municipal works should be entrusted to the same combine. The manager of an eastern trading syndicate with headquarters at Hamburg, who was well known in Batavia both before and after the war, in a recently issued brochure throws doubt on the future of certain Dutch Indian industries which were started a few years ago.

The Stinnes group is by no means restricting its activities to the building or assembly of rolling stock and the supply of iron and steel and similar engineering accessories. Its representatives are closely following every possible development that would lead to a demand for machinery or material.

It is practically certain that they will seek to arrange for the local manufacture of textiles, but it is more than probable that many years would elapse before the establishment of cotton mills in Java would seriously affect Manchester's exports to Insulinde.

Yet it would surely be fitting, says *The Times* (London), for British enterprise and finance to be associated with the production of such manufactures. There is reason to believe that the Dutch East Indian government would offer advantageous conditions. Terms that have been suggested include the purchase by the state of the whole of the first year's output at cost price plus 12 per cent., one million yards of material during each of three succeeding years at 12 per cent. above competitive prices, one million yards for three further years at a 10 per cent. preference in price, etc. In the tenth year one million yards at competitive quotations. After the tenth year the factory would stand on its own footing.

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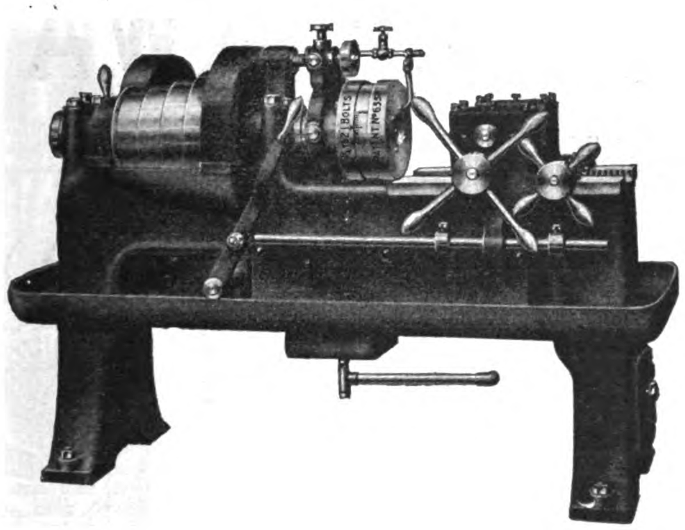

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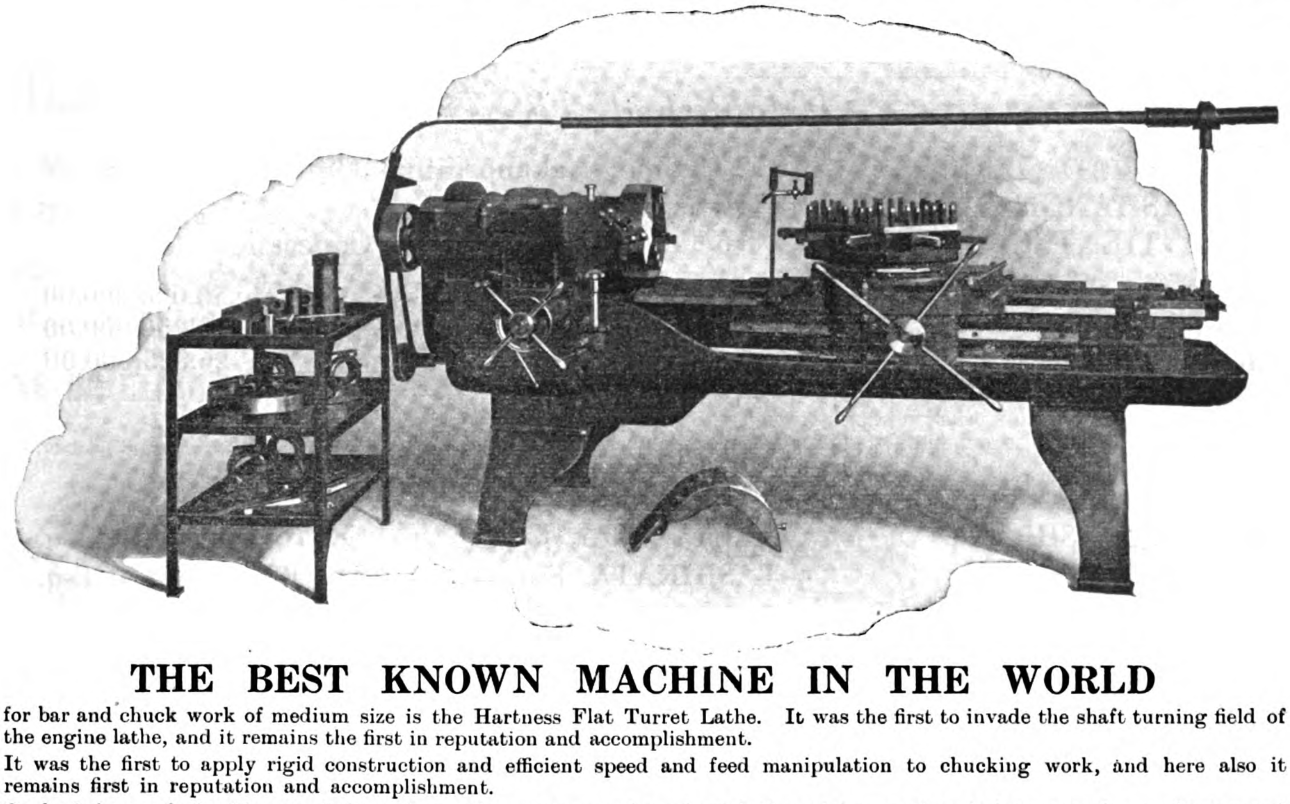

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Capital paid-up	Yen 20,250,000.00
Reserve Funds	Yen 26,825,000.00

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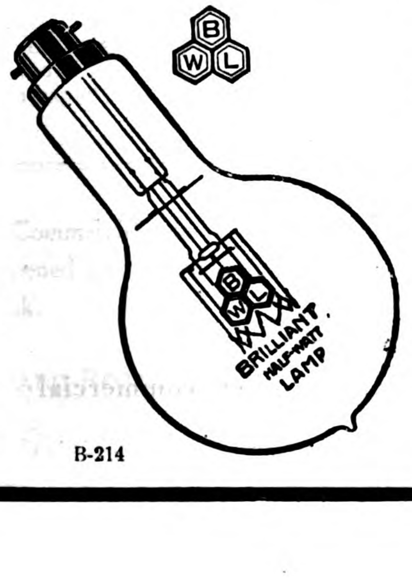

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Capital Paid-up - - - Yen 50,000,000

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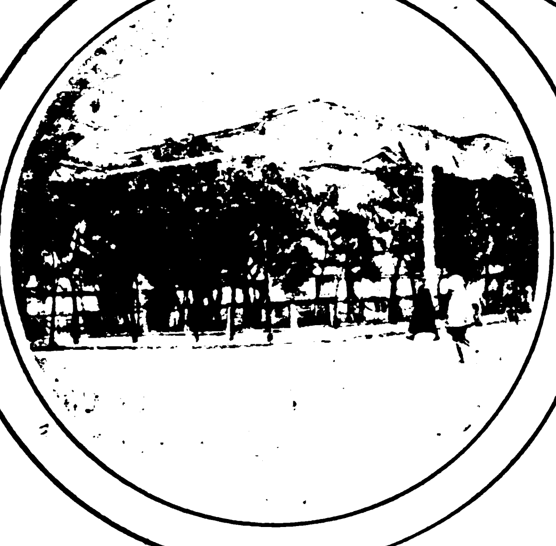

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INCORPORATED BY SPECIAL IMPERIAL CHARTER, 1899

Capital Subscribed - - - - - - -	Yen 60,000,000
Capital Paid-up - - - - - - - -	,, 45,000,000
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Established March, 1912
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Capital Paid-up	„ 40,000,000	Deposits	„ 38,100,000

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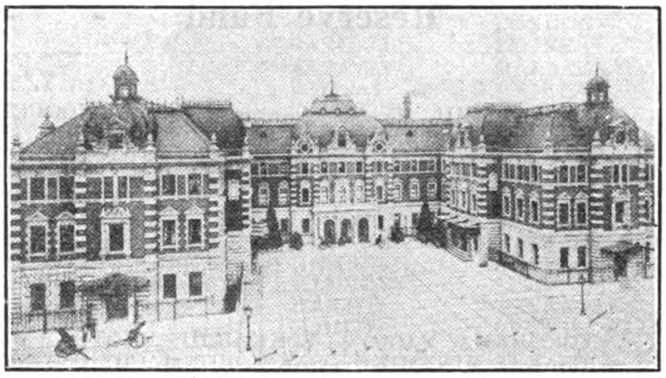

Capital Subscribed... ....Y. 100,000,000.00
Capital Paid-Up.....................Y. 60,000,000.00
Reserve Fund (July 1921)......Y. 28,000,000.00

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Reserve Fund - - - -	Yen 31,500,000.00

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HEAD OFFICE:

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KYOTO BRANCH: Shijo Higashinotoin
SHINMACHI BRANCH: Shinmachi Dori Sanchome

President: K. IKEDA, Esq.

Managing Director: S. CHOH, Esq.

SUBSCRIBED CAPITAL - - - -	Yen 25,000,000
CAPITAL PAID-UP - - - - -	Yen 17,500,000
RESERVE FUND - - - - -	Yen 8,094,340
DEPOSITS - - - - - - - -	Yen 110,740,264

Transacts General Banking and Foreign Exchange Business. Conducts Trust Company Business

Hongkong and Shanghai Banking Corporation

Paid-up Capital	...	$20,000,000
Reserve Funds: Sterling	...	£4,500,000
Silver	...	$23,500,000
Reserve Liability of Proprietors	...	$20,000,000

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G. H. STITT, *Manager.*

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This coupler has the desirable feature of easy accessibility of parts, thus facilitating the making of repairs.

Furnished with various designs of rear end to suit different types of Draft Rigging.

Manufactured exclusively by

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Cable Address—Torley, Pittsburgh

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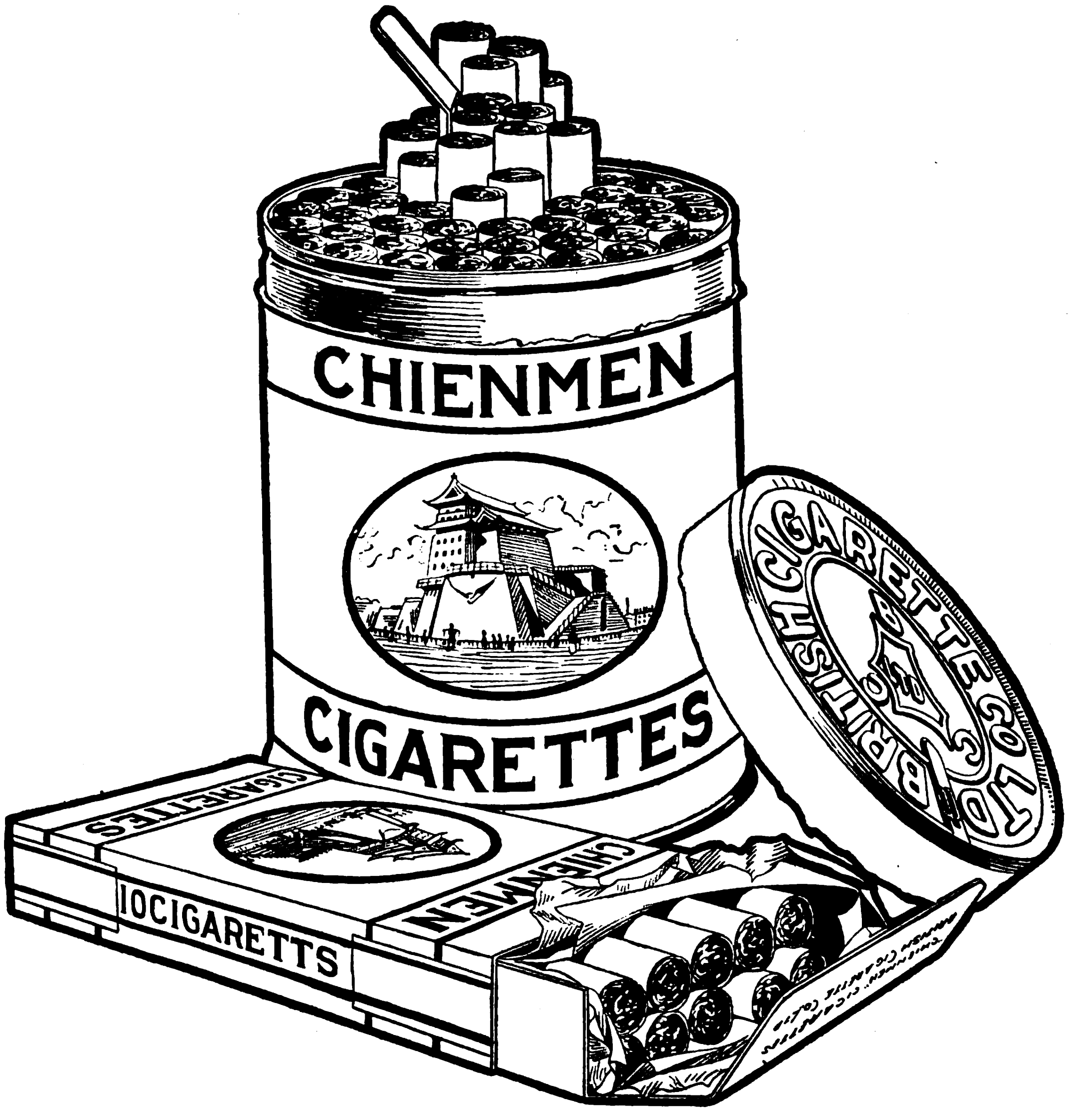
CHIENMEN

Cigarettes



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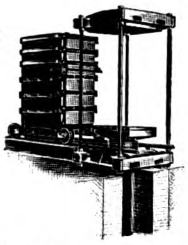

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for packing goods of every description, for Home and Foreign transport.

May we have your enquiries ?

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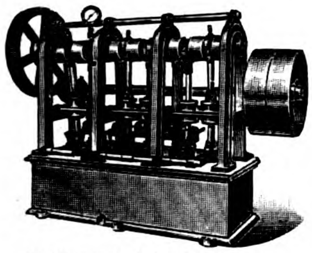

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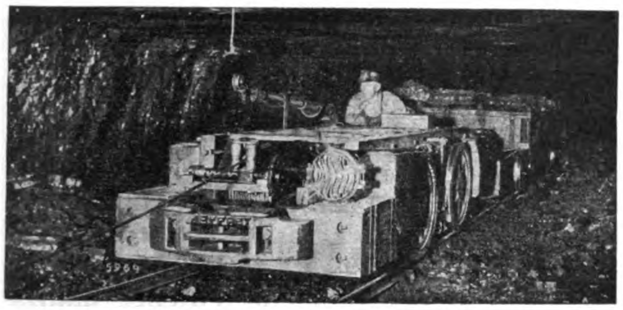
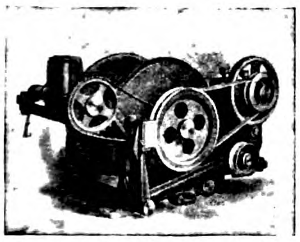
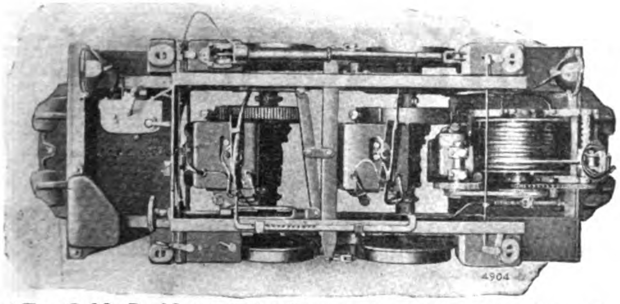


Cable Reel Locomotive pulling loaded car from room



Standard Cable Reel Device, Motor Driven. A complete unit and self contained, and can be supplied to be driven from the intermediate shaft or from an independent motor. If tension in the cable when reel is winding is too great, the driving belt will slip.



4-Ton Cable Reel Locomotive showing accessibility of equipment

Especially Adapted for Gathering Cars from Rooms Where It is Not Practical to Use Trolley Wires

The Jeffrey Cable Reel Type Mine Locomotive

Has Outside Wheels. Is made in 4, 6, and 8 tons. Frames of 4 and 6 ton sizes are of structural steel—8 ton Locomotive has armor-plate frames.

Center of drum is made of wood and the steel flanges are thoroughly insulated from the locomotive frame and no earth can therefore occur in case the insulation should be worn off from the cable. The belt drive provides a slip preventing pulling the cable in two or pulling down the trolley wire.

The Jeffrey Mfg. Co., Columbus, Ohio, U.S.A.

JEFFREY
MINING EQUIPMENT

SOUTH MANCHURIA RAILWAY

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Tourists in the Far East should not miss Manchuria. Through Japan, Chosen (Korea), and Manchuria (or vice versâ) is an ideal trip, combining the distinctive characteristics of three unique and profoundly interesting countries.

THE CHOSEN AND MANCHURIA LINES are under the management of the South Manchuria Railway Company. Express trains have been temporarily suspended (except between Fusan and Seoul and Dairen and Changchun), but the **ORDINARY TRAINS ARE EQUAL TO MOST AMERICAN TRAINS,** run at least twice a day from each end, and to some of them Sleeping and Dining Cars are attached. Sleeping berths should be reserved in advance.

HOTELS under the Company's management are established **ON FOREIGN LINES** at **SEOUL** (capital of Chosen), **FUSAN** and **SHINGISHU** (the two extremities of Chosen), **KONGOSAN** (the famous Diamond Mountain of Korea, rivalling Switzerland in scenery), **MUKDEN** (ancient capital of China, home of the Manchuria Dynasty, noted for Imperial Palaces and Tombs), **CHANGCHUN** (junction for three railways and "key to Manchuria"), **PORT ARTHUR** (of world-wide fame for its historic sieges and ruined forts), **DAIREN** (one of the greatest commercial cities in the Orient), and **HOSHIGAURA** (the finest seaside resort in North China).

FROM DAIREN there are **FREQUENT AND REGULAR STEAMERS** to and from Shanghai, Tsingtao, Tientsin, etc.

For pictorial guide-books, pamphlets, and further particulars, apply to the Tourist and Ticket Agencies, or direct to the

SOUTH MANCHURIA RAILWAY COMPANY

Head Office: DAIREN

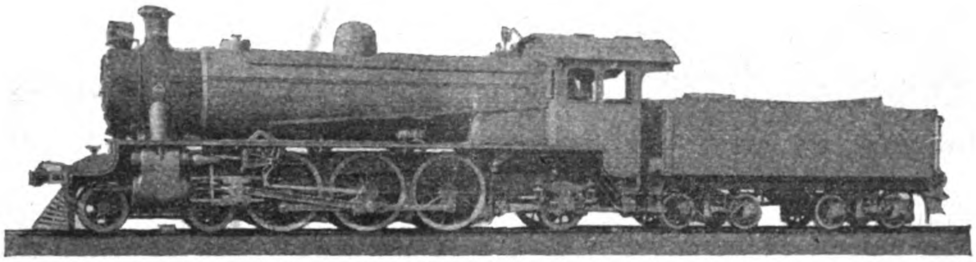
Branch Offices: TOKYO, SEOUL, HARBIN, KIRIN, PEKING, SHANGHAI AND NEW YORK.

Telegraphic Address: MANTETSU or SMRCO. Codes: A.B.C. 5th & 6th Editions, A1 Lieber's, and Bentley's

BALDWIN

Peking-Mukden Railway

Orders additional Baldwin Pacific Type Locomotives after severe operating tests



Gauge, 4' 8½". Cylinders, 20" by 26". Working pressure, 180 pounds. Fuel, Coal. Driving wheels, diameter, 66". Weight, engine, 175,200 pounds. Total weight, engine and tender, 296,000 pounds. Service, Passenger

巴爾威

IN the early part of 1920, five Baldwin Pacifics were placed in service on the Peking-Mukden Railway—one of China's most important lines. They proved so successful in operation that five additional locomotives of the same type were ordered from us in 1921.

The design for these Baldwin Pacifics included all American standards in conjunction with plate-frames, and a number of European specialties.

We co-operate with railways in designing and building locomotives to meet their requirements

THE BALDWIN LOCOMOTIVE WORKS

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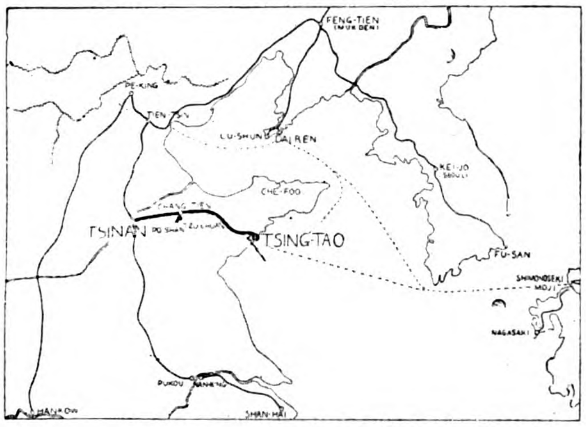
LOCOMOTIVES

SHANTUNG RAILWAY

The Shortest Route between Japan and North China



THROUGH TRAFFIC

Through passenger tickets are issued between the following principal stations of the Shantung Railway: Kiaochow, Kaomi, Fangtsu, Weihsien, Chingchow, Changtien, Choustun, Tsinan, Tzuchuan, Poshan, and the following points: In Manchuria—Port Arthur, Newchwang, Liaoyang, Fushun, Mukden, Tiehling, Kaiyuan, Changchun, Penchihu, Antung, and Dairen; in Japan—Tokyo, Yokohama, Nagoya, Kyoto, Osaka, Kobe, Ujina, Moji, Shimonoseki, Nagasaki and Shanghai.

Steamer Connections—Steamers leave the wharves of the Large Harbour, Tsingtao, for Moji and Kobe every five days, for Shanghai about twice a week and for Dairen about three times a week.
For giving facilities to through passengers for Japan, a special train in connection with the night train No. 4 is operated from the Harbour Station to the Wharf, direct alongside the ship, on those days when the liners of the Nippon Yusen Kaisha, Osaka Shosen Kaisha, and Harada S.S. Co. are leaving.
Through passengers and their luggage are carried free of charge for this section.

Collieries—The Tzuchuan (Shisen) and Fangtzu (Boshi) Collieries are managed by the Mining Department of the Shantung Railway. At present the daily output of Tzuchuan coal is about 1,500 tons, far surpassing the amount taken out when the Germans were in control. The coal is well-known for its good quality and fair price.

Tsinan—Tsinan, the capital of Shantung, is the western terminus of the Shantung Railway, and also one of the most important stations on the Tientsin-Pukow Railway.
The Tsinan Railway Hotel, furnished in modern European style, is found on the upper floor of the Tsinan Station, under the control of the Shantung Railway Administration.

THROUGH TRAIN SERVICE

Train No. 1 leaves Tsingtao daily 10.00 p.m. arrives Tsinan 8.00 a.m.
Train No. 3 leaves Tsingtao daily 8.00 a.m. arrives Tsinan 6.40 p.m.
Train No. 2 leaves Tsinan daily 11.00 p.m. arrives Tsingtao 8.35 a.m.
Train No. 4 leaves Tsinan daily 10.10 a.m. arrives Tsingtao 8.20 p.m.

Local Trains run between Tsingtao and Kaomi, Weihsien and between Fangtzu and Tsinan, and on the Poshan and Tzuchuan colliery branches.

Fares—Tsingtao-Tsinan—1st class, $14.30; 2nd class, $7.20.

First Class Sleeping Car—A first-class sleeping car is attached to night trains Nos. 3 and 4 running between Tsingtao and Tsinan. For a berth in the sleeping car in S.Y. 3.00 for the lower berth and S.Y. 2.00 for the upper berth is charged in addition to the ordinary first-class fare, irrespective of distance.

Dining Car—A dining car is attached to through trains Nos. 1, 2, 3 and 4 running between Tsingtao and Tsinan. Meals are served to order at any time.

Ticket Agencies—Messrs. Thos. Cook & Son and their branch offices in various parts of the world. The Japan Tourist Bureau in Tokyo and their Agents in Yokohama, Kobe, Nagasaki and Peking.

Connections at Tsingtao—By steamer with Japan, Manchuria and Shanghai.

Connections at Tsinan—By Tientsin-Pukow Line with Tientsin, 6.00 & 9.38 a.m. daily, and with Pukow, 7.44 a.m. & 10.21 p.m. daily.

BATHING BEACH, TSINGTAO.

Description of Tsingtao

Tsingtao is considered the most healthful place in all the Far East. The scenery including both mountains and sea, is most beautiful. There are quite extensive forest gardens, bits of woodland here and there, and many delightful shady lanes affording most interesting walks through them.

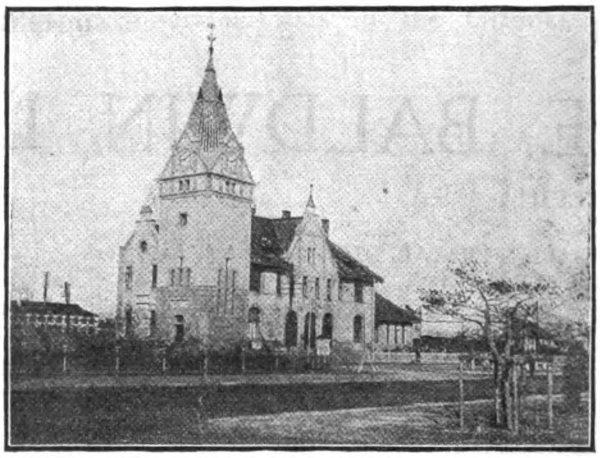
The roads are all broad, with very moderate gradients. They are of both macadamized and asphalt construction for vehicle traffic, while the sidewalks are either paved or concrete. These streets are practically all lined with beautiful shade trees.

The buildings are constructed principally in modern European style, with red tiles and white walls, contrasting pleasantly with the surrounding green mountains and blue sea.

The climate here is fine from Spring to Autumn, being neither too hot nor too cold. These climatic conditions make the place a favourite summer resort for Europeans and Americans from Shanghai, Tientsin, and other places.

The hotels are luxuriously furnished with up-to-date equipment and are under the efficient management of Mr. H. J. Hearne.

The hotel rates are $6.00 and up, per day, on the American plan.



TSINGTAU STATION

For Further Information, please apply to

THE SHANTUNG RAILWAY ADMINISTRATION, TSINGTAO

CABLE ADDRESS: "SANTETSU" CODES: A.B.C. 5TH ED. & AI.

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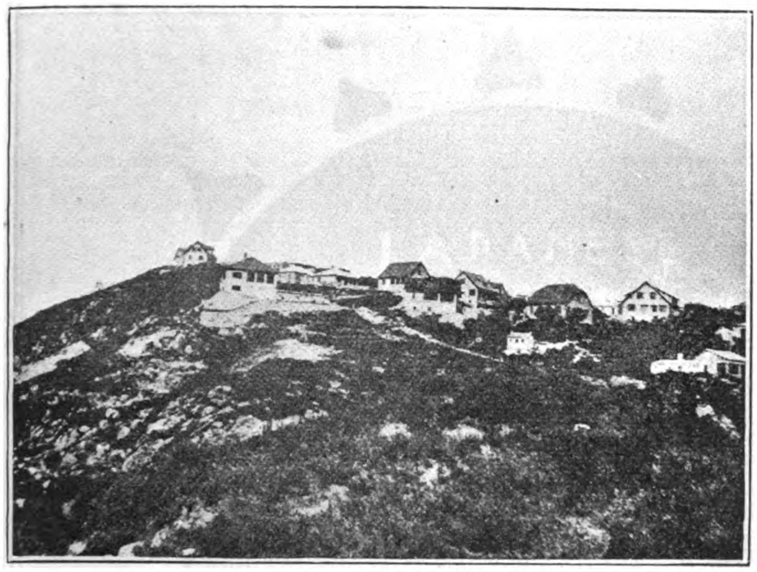
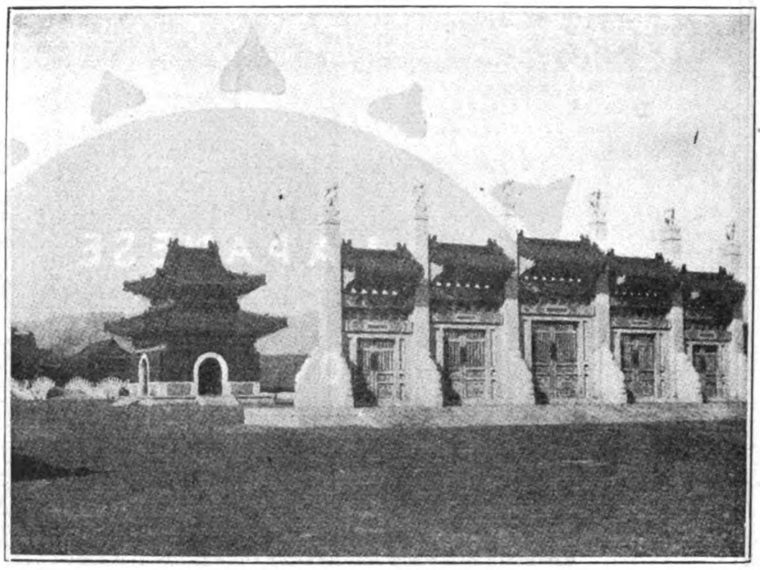


SUMMER RESORT AT CHI KUNG SHAN



AT THE CHUNG LING TOMBS

PEKING-HANKOW LINE

"The Road Through The Heart of China"

THE Peking-Hankow Line, the most important section of China's overland route, enables tourists and travellers to get a glimpse of Old China, the train passing through magnificent scenery, traversing the great plains of Chihli, the central portion of Honan and the mountainous regions of the eastern Hupeh province.

The Peking-Hankow route joins at Fengtai the main line of the Peking-Mukden Railway, by means of which this line is connected with the railways in Manchuria, Korea, Japan, and Siberia, while steamer facilities at Hankow bring it into easy communications with the Yangtze River ports and Shanghai.

From the Capital to Hankow the journey occupies 34 hours, by the daily through train which is provided with up-to-date sleeping and dining accommodations.

In the future, this line will connect by means of a ferry-boat the Hankow-Canton Railway whose completion will bring the Capital of China, and Hankow, the Great Central Market, within easy distance of Canton the southeastern metropolie.

From the Capital to Hankow the journey about 30 hours by the bi-weekly "Express" through train which is provided with up-to-date sleeping and dining accommodations.

Chikungshan Mountain (Summer Resort).—Not many Summer Resorts in China inland, can bear comparison with the natural charming views, that reward those who ascend the mountain of Chikungshan, whose summit stands at an altitude of 1,980 ft. On reaching Sintien station, situated 110 miles from Hankow, a serpentine road climbs the mountain, on top of which are hundreds of beautiful bungalows awaiting vacationists. This popular resort is celebrated for its scenery, where an almost unbroken communion with nature can be enjoyed for a week at a time.

Hsi-ling or Western Imperial Tombs.—With their present-day accessibility, there is now little excuse for visitors to Peking omitting a trip to the Western Imperial Tombs, undoubtedly one of the most impressive sights in China. The site of these beautifully adorned Imperial Tombs is close to Liang Ko Chwang station, 79 miles from Peking, which is reached by a Branch-line, formerly built for the exclusive use of the Imperial Sovereigns when visiting the Tombs of their ancestors. The Western Tombs include the mausoleums of four Manchu Emperors and three Empresses, as well as those of a number of Princesses. The region, as a well laid-out park, closely wooded, is justly appreciated for the charming scenery surrounding the Imperial Tombs and is highly recommended to any one in search of the extraordinary and beautiful.

For Particulars, Pamphlets, Reservations, Tickets, etc., apply to the "Information Bureau" at Peking Head Office or to Tourist Agencies.

Telegraphic Address: "KINCO" **Codes: A.B.C. 5th Edition** **Telephone East 1698**

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   c/o Traffic Bureau, Japanese Government Railways

For Particulars, Time-Tables, Guide Books, etc., please apply to
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JAPANESE GOVERNMENT RAILWAYS

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CHINA

Single and Return Tickets between China and Japan via Chosen

Period of Validity: Single, 40 days: Return, 110 days. 20% Reduction for Return Tickets

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Period of Validity: Two months. Reduction: 25%-50% for 10 or more passengers

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Parcel through conveyance between the principal stations in China and Japan viâ Chosen at low rates

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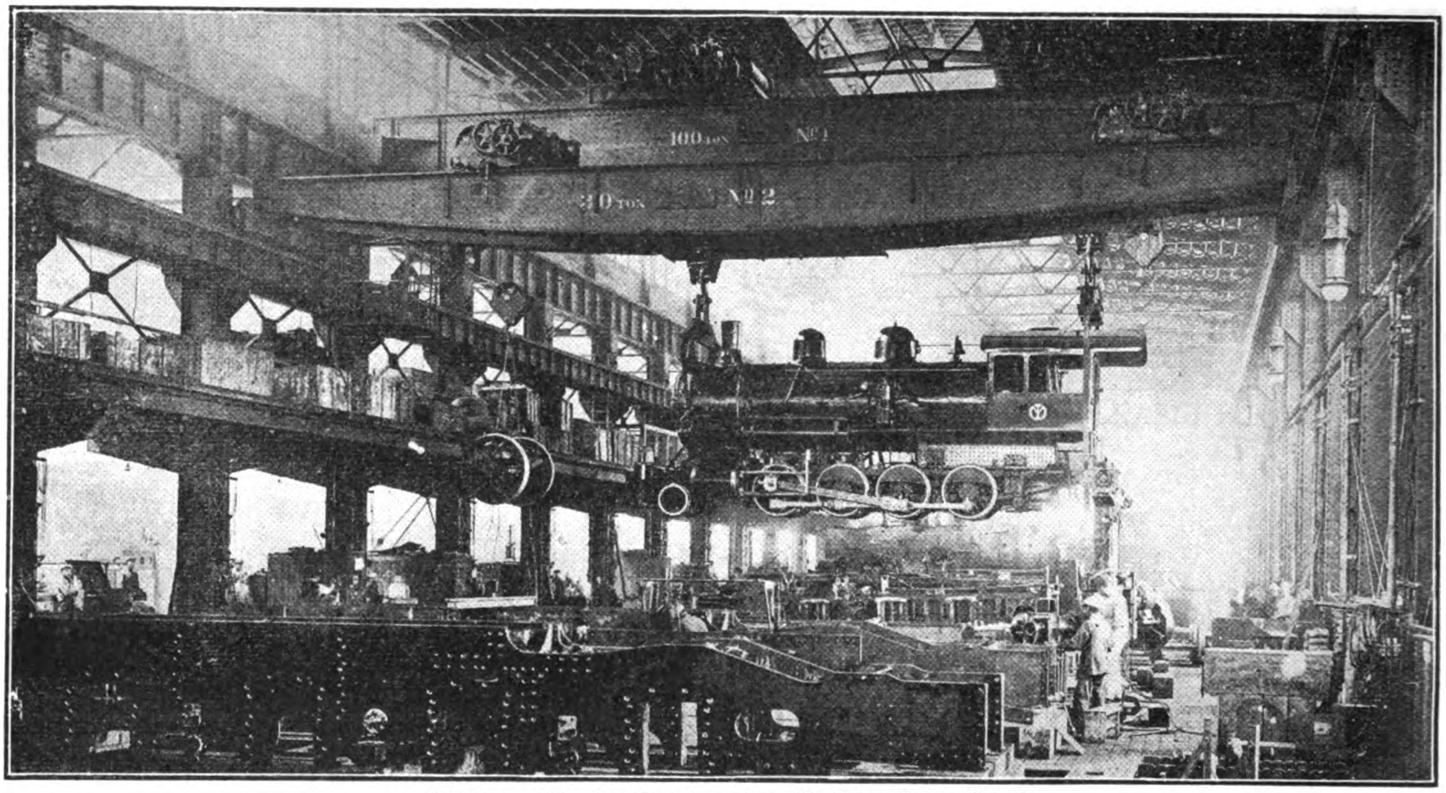
SOUTH MANCHURIA RAILWAY

RAILWAY

SHAKAKO WORKSHOPS



Interior of Engine Erecting Shop, Shakako Shops, S.M.R.

LARGEST AND MOST COMPLETE IN ALL MANCHURIA AND CHINA

AREA OF LAND: About 300,000 Tsubo. OFFICES & WORKSHOPS, 14,000 Tsubo

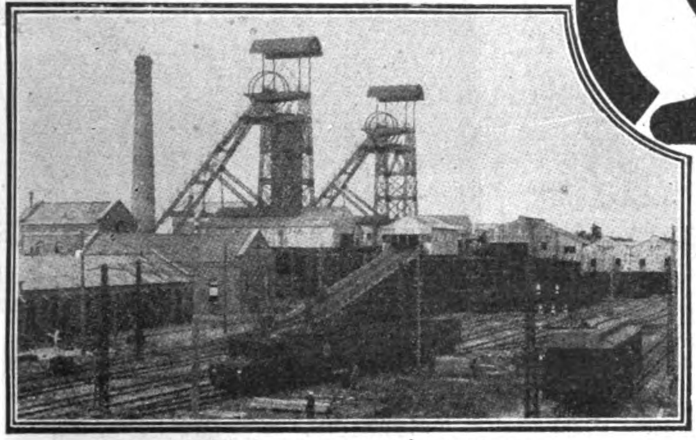
CAPACITY OF EXECUTING REPAIRS SIMULTANEOUSLY:

27 Locomotives, 36 Passenger Cars, and 130 Freight Cars, besides Constructing and Repairing other Railway Materials, Mining Machinery, etc. Employees: 5,000 Japanese and Chinese.

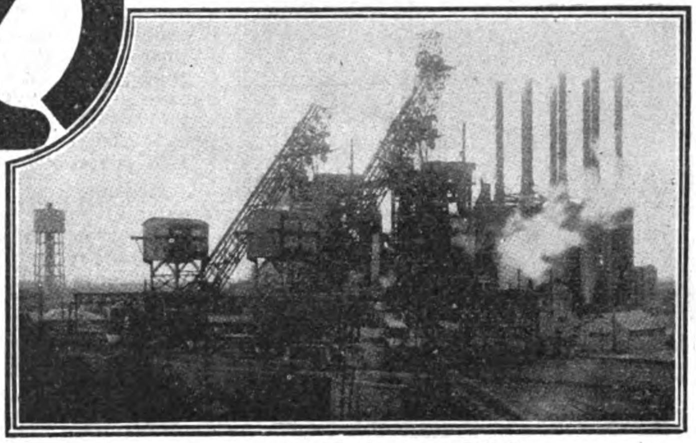
THE EAST IS EAST AND THE WEST IS WEST

SOUTH MANCHURIA RAILWAY

COAL IRON



Togo Pit of the S.M.R. Fushun Collieries



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FUSHUN COAL

The Best Steaming Coal in the Far East | Fresh Stocks Always on Hand

Depots:

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Chefoo	Takao	Osaka
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Sourabaya	Yokohama	Moji
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Penang	Niigata	etc.

Also Sulphate of Ammonia, Fire Clay, and Talc

Pamphlets and Particulars gratis from any of the above Depôts and Agencies, and from the

MINING DEPARTMENT,

South Manchuria Railway Company, Dairen

ANZAN IRON & STEEL WORKS

New Enterprise Set Up Like Magic Amidst the Wilderness of Manchuria.

TRACT OF LAND: about 4,000,000 tsubo.

BLAST FURNACE No. 1 (with a capacity for about 350 tons per day) Opened to service on April 29, 1919.

BLAST FURNACE No. 2 (with a capacity for about 350 tons per day) Made ready for service on February 24, 1920.

MEANS OF TRANSPORTATION in the plant: 24 miles of railway and 2.5 miles of electric tramway in operation, with three light locomotives and a number of slag-, coke, and ore-cars of from 8 to 24 tons.

A NEW TOWN SITE of 400,000 tsubo, with the necessary roads and water and sewage services, laid out and rented to lessees.

OFFICIALS AND EMPLOYEES: 2,300 Japanese and Chinese.

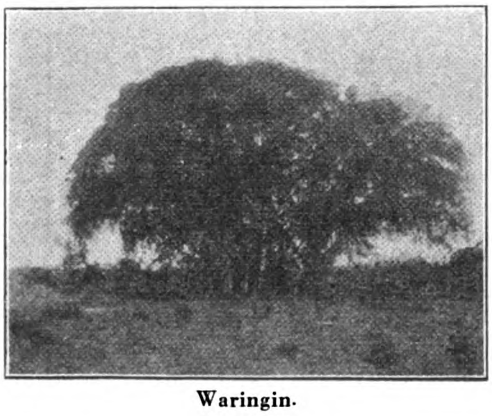
BUT THE TWAIN HAS MET AND BLENDED HERE

JAVA—THE WONDERLAND

HAVE YOU NOT YET VISITED JAVA?
IF NOT, DO SO NOW!

Bridge Bi Cis, Soerabaia Goods-shed, Java State Railways, Soerabaia City.

Girl Carrying Capoc.



Waringin.

Java, the peerless gem in that "magnificent Empire of Insulinde, which winds about the equator like a garland of emeralds," is the ideal tropical island, the greenest, the most beautiful and the most exquisitely cultivated spot in the East, the most picturesque and satisfactory bit of the tropics anywhere near the world's great routes of travel.

It fulfils the conception of what a paradise ought to be. It satisfies the imagination and more—for no Northern imagination ever conceived of skies so soft or indolent as these, of seas so serene and beautiful, of landscapes so exquisite or of nature so bountiful.

There is something here for every taste. The sportsman will find excellent big game shooting—the architect and the archeologist will delight in exploring the ruins of Buddhistic and Hinduistic temples. Those studying social and political problems resulting from colonial possessions can study here one of the most successful colonial systems existing. The geologist will grow enthusiastic over the many volcanoes active or quiescent, found here. At Buitenzorg, one hour's run from Batavia, the botanist has at his disposition the largest and best equipped Botanical gardens of the universe. The agriculturist will delight in the many cultures as f.i. rice, tea, coffee, rubber, etc., found here. Moreover, travelers are entirely safe in Java and even ladies alone can tour the island without inconvenience.

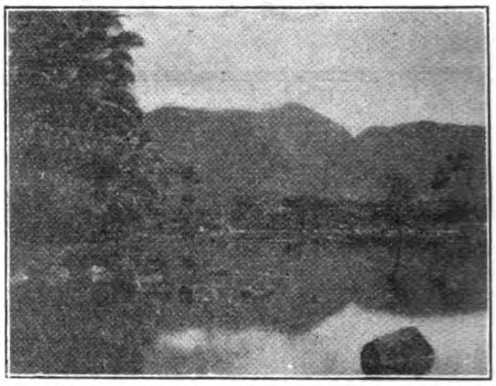
And to close this incomplete list of Java's advantages, it is singularly accommodating as regards climate. Thanks to the mountainous character of its physical conformation, and the different altitudes of its towns and hill stations, the visitor can select the climate best suited for his constitution. In a few hours he may change from the tropics to the temperate zone, may migrate from Batavia to Sindanglaja, 3,483 feet above the sea-level, or from Soerabaia to Tosari, at an altitude of 5,776 feet, and famous for its bracing air.

Few tourist playgrounds, in fact, are so favored, or possess a greater variety of attractive features.

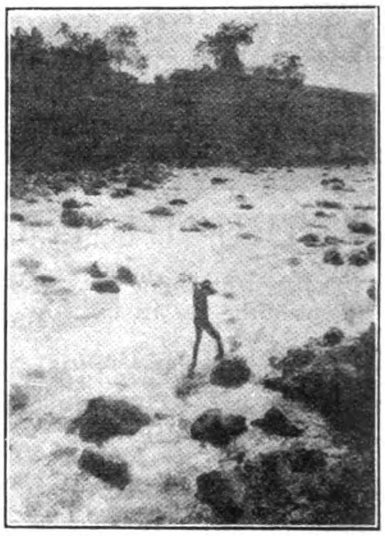
THE JAVA GOVERNMENT RAILWAYS own 2,629 miles of thoroughly equipped lines, passing through all the principal Tourist centres.

Comfortable travelling—frequent express and fast trains. Restaurant cars with efficient service in all express and fast trains.

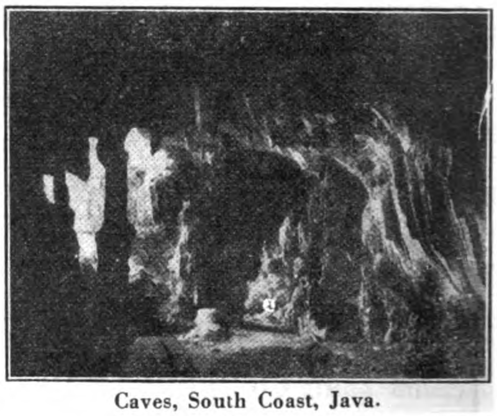
For full information and literature apply to the "Official Tourist Bureau" at Weltevreden, Rijswijk 18.



Pond in the Neighborhood of Garoet.



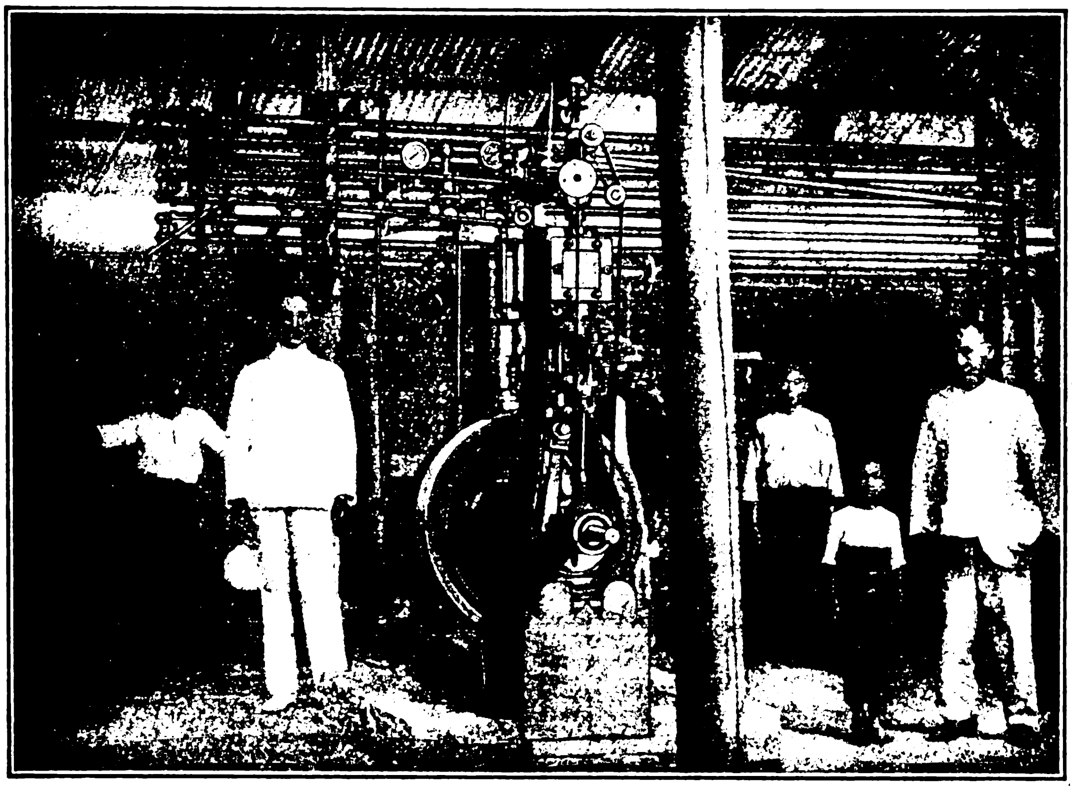
River Brantas, Malang.



Caves, South Coast, Java.

THE JAVA GOVERNMENT RAILWAYS

The photographs in this advertisement are from "The Joint-Stock Co., Photographer's Studio, Kurkdjian, Soerabaia."



Brunswick Refrigeration

has won world-wide popularity and success.

There is hardly a country in which you will not find some notable example of the Brunswick Equipment, purchased years ago and still operating efficiently.

Above is shown the first

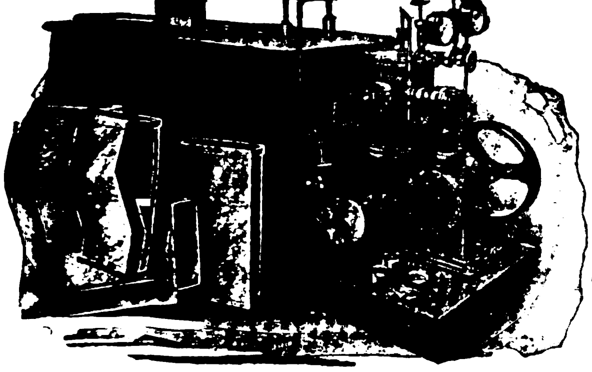
Brunswick Plant in Siam

This plant was furnished the Singora Ice Factory in 1911. It is still functioning successfully and its satisfactory service has influenced the ordering of many other machines. Long, continuous, economical service is the best proof of heavy and rugged construction.

We want you to know more about the Brunswick machines.

BRUNSWICK REFRIGERATING CO.

DEPT. 2, NEW BRUNSWICK, N.J., U.S.A.



BRUNSWICK

We especially call attention to our standard portable ice-making plant shown opposite. This little equipment produces 250-lbs. of ice daily. It is shipped complete and ready to make ice as soon as charged with ammonia and connected to power and water supply. We also manufacture ice-making machines varying in capacities up to six tons daily.

THE "TEETH OF FRICTION"

CAN'T BITE IF YOU LUBRICATE WITH

DIXON'S FLAKE GRAPHITE FOR CYLINDER LUBRICATION

Using Dixon's Flake Graphite for cylinder Lubrication means a reduction in the cost of lubrication, combined with better lubrication.

Although Graphite cannot be injected into the cylinders through ordinary lubricators, there are several special devices on the market that successfully feed dry flake Graphite or mixtures of Graphite and oil. These devices soon pay for themselves by causing a wonderful saving in the cost of lubricants.

BETTER CYLINDER LUBRICATION

By using Dixon's Flake Graphite regularly and properly a very great saving can be effected in the cost of cylinder lubrication.

It will not only bring about better lubrication that can possibly be obtained with oil alone but the wear and tear on machinery will be reduced to a minimum. Such incidents as sticking and groaning of valves, particularly on air compressors, will entirely disappear. Rod packing lasts indefinitely. A perfect smoothness will be secured in cylinders that are cut or scored.

Graphite cannot be fed through ordinary oil lubricators as it clogs the oil passages. There are several special devices that have been successfully designed to feed dry flake graphite or mixtures of graphite and oil. These devices soon pay for themselves inasmuch as they really effect a great reduction in the cost of cylinder lubrication.

Send for the book—"A Study in Graphite" No. 94-C.

Made in Jersey City, N.J.

by the

Joseph Dixon Crucible Co.

Manufacturers of

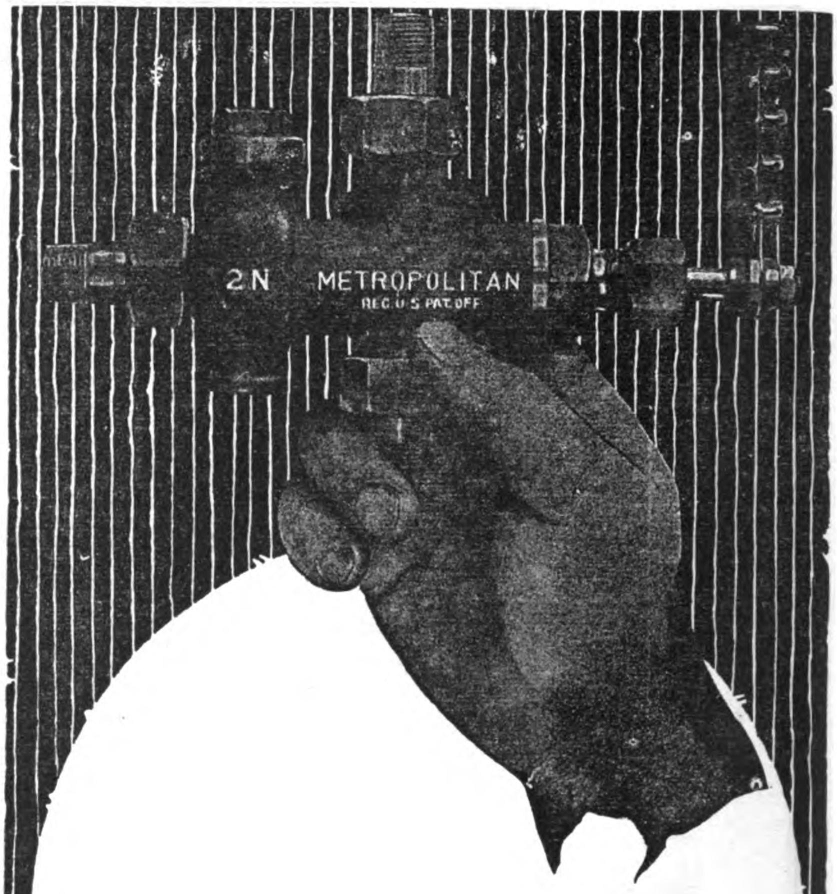
LUBRICANTS, CRUCIBLES, PAINT, PENCILS AND OTHER GRAPHITE PRODUCTS

Established, 1827

For Prices, Information, etc., communicate with

HENRY KATTEN

22 Kiukiang Road
Shanghai, China



Metropolitan Injectors for Small and Portable Boilers

Metropolitan Injectors, Model N., are distinguished by their simplicity of operation. They are controlled entirely by a single handle. No valve to adjust, pack or grind. A simple turn to the left starts them—a turn to the right stops them.

They operate on any steam pressure from 20 to 160 pounds without adjustment, lift water 20-ft., and automatically restart after a temporary interruption of the steam or water supply.

These features make this type especially adapted to service on small and portable boilers.

Also made in a double-tube type (Model O) which is adapted for larger power plants and for service on stationary and marine boilers.

Connections made either flanged or screwed, conforming to British or Metric standards.

Our agent is prepared to advise with you and quote prices. Consult him also, regarding Ashcroft Gauges and Consolidated Safety Valves, used for years by engineers the world over.

Manning, Maxwell & Moore, Inc.

New York

Henry Katten, 22 Kiukiang Road, Shanghai, China

METROPOLITAN INJECTORS

THE

North-China Daily News

Established in 1850 as a weekly; in 1870 as a daily

To the Reader

The "North-China Daily News" writes the history of China. It records the pulse of its politics; it reports the conditions of its finance and its markets; and it chronicles the daily doings of its people.

To the Advertiser

The greatest purchasing power in China is that possessed by readers of the "North-China Daily News." It is the newspaper which is found in every office, consular or commercial; it is the newspaper most frequently quoted both by the foreign and vernacular press; and it is the one newspaper which combines a quality with a quantity circulation—being the largest both in size and circulation in China. It was the first newspaper to publish audited circulation statements.

Subscription: Mex. $28 per annum.

(Postage Extra).

The North-China Herald

Is the weekly edition of the "North-China Daily News" for readers abroad. It contains 95 per cent. of news and is the best medium for keeping in touch with events in China when out of reach of the daily.

Subscription: Mex. $16 per annum.

(Postage Extra).

Copies of either of the above publications will be sent to anyone interested on request.

NORTH-CHINA DAILY NEWS & HERALD, LTD.,
Shanghai.

Telegraphic Address: "Herald Shanghai."—All Codes.

A NORTH-CHINA TRADE DIRECTORY

The North China Desk Hong List

Is the only Trade Directory of North China issued twice a year. Its information is the most accurate and complete. Published regularly since 1865 it has grown to 900 pages. In addition to the names and addresses of every foreign firm, resident, and missionary in China it contains the following classified information:—

SHANGHAI HONG LIST.—All firms, institutions, missions, consulates, etc., in Shanghai, with staffs, arranged alphabetically.

TRADE DIRECTORY.—A list of all Shanghai firms under their professional or trade headings.

AGENCIES.—Agencies held by Shanghai firms are listed alphabetically, with the firm's name after them.

STREET DIRECTORY.—A list of the streets of Shanghai in English and Chinese, with the occupants of all foreign and many Chinese houses, offices, and stores.

SHANGHAI WHO'S WHO.—An alphabetical list of the men of Shanghai, with their business addresses.

RAILWAYS.—A list of the Northern Railways of China, with their foreign and native staffs, including those resident in Shanghai.

RESIDENTIAL DIRECTORY.—A complete list of the foreign residents of Shanghai, arranged alphabetically, with their private addresses.

OUTPORT HONG LIST.—A list of Northern and Central China cities and outports with foreign firms and institutions and their staffs.

OUTPORT WHO'S WHO.—An alphabetical list of foreign men in Northern and Central China, compiled from the Outport and Railway Sections of this work.

OUTPORT LADIES' LIST.—An alphabetical list of foreign ladies, not engaged in mission work, resident in Northern and Central China.

OUTPORT MISSIONARIES.—Classified alphabetically by provinces. Under the names of the provinces are given the towns where missions are established, with list of residents. This is divided into two sections: (1) Protestants, (2) Roman Catholics. Mission Institutions, such as Schools, Colleges, etc., will be found under the respective Ports in which they are instituted.

MISSIONS WHO'S WHO.—An alphabetical list of missionaries of each denomination, compiled from the previous section.

GENERAL.—Consular, postal, exchange and other information.

PRICES:

Shanghai $8 with map $6 without map

On Sale at the Offices of

The North-China Daily News

(Temporary offices during rebuilding)

2B Kiukiang Road, Shanghai

IF you are looking for Authoritative information about the Financial, Engineering and Industrial developments in the countries of Eastern Asia, you should subscribe to

THE FAR EASTERN REVIEW

THIS IS THE

ONE BIG MONTHLY OF THE ORIENT

THE FAR EASTERN MOTORS

Bi-Monthly Supplement to the "Far Eastern Review"
Devoted to the Development of Automotive Interests in the Far East

Transportation in China

By Lawrence Impey, C.E. Associate Member Inst. Municipal and County Engineers

Late Chief Engineer, American Red Cross Famine Relief

It is undoubtedly true that the greatest factor in retarding the growth of Chinese industries and the development of China upon modern lines has been the lack of communications.

Railways have been constructed during the last twenty years which have done much to lessen the problem of transportation, but it is a truism which has been aptly pointed by the recent war, that railways without roads resemble a man without arms.

Even in Western countries the value of roads has only been realized during the last twenty years, their value, that is, as a means of developing the industries of a countryside by filling the gaps in a railway system or systems, and acting as feeders to the great industrial centres through the use of the automobile.

Forty years ago roads were regarded only as a method of transport for carts on short haul, travelers in the locality, etc.; but the advent of the modern road and the high power automobile has changed the whole problem of food supply and passenger traffic.

All materials have to be handled six times under the present system of delivery to railhead, transit, and delivery to destination.

If these same materials can be delivered with only the handling incidental to one loading and unloading the costs will have been lessened 70 per cent., and at the same time if the destination is not over 100 miles a great saving is effected in the time of delivery.

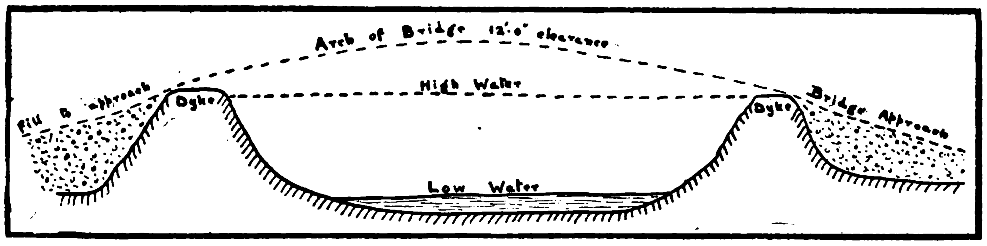
In a country such as China, with its great distances, the best solution of the transport difficulty is to be found in a network of railways which will carry the long distance traffic, with a system of roads and automobile transportation effecting local delivery and collection.

To turn to the consideration of the technical difficulties in the way of an efficient road system, we find that these vary greatly with the terrain of the different provinces through which the road is to be built.

In Shantung, for instance, as was found by the American red cross in 1921, it is impossible to obtain surfacing material close at hand, and the rail facilities for the transportation of stone from the hills will not be available for some years at least, the cost of metalling therefore being prohibitive, so that the expenditure of haulage power will always be high relatively, and the surface repairs necessarily frequent.

Costs in this dirt construction will be much lower however, about $2,000 to $3,000 a mile being sufficient, including culvert work, with the exception of possibly one or two large river transits.

The problem of crossings to some of the canals will undoubtedly be one of the most difficult, as the rise and fall of the water varies in the rainy season from ten to twenty feet, and the surrounding country being below water level the approach to the bridge is rendered very sharp in its gradient (see Diagram 1.)



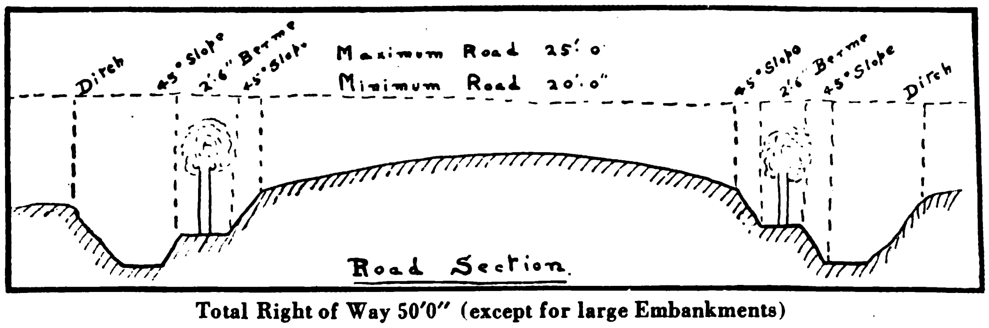
Canal Bridge
(at least 12'0" clearance for Barges above High Water Mark)
Pontoon Bridge inadvisable owing to Rise and Fall of Water Level

In the mountainous province construction will be more expensive, the red cross costs in Shansi being between $4,000 and $5,000 a mile, including the culverts; but on the other hand the road will be durable, rock surfacing and a good foundation being thus provided by natural conditions.

The advantage of the road for transport in the interior is very marked, as the low gradient necessary for railway construction is very difficult to obtain in mountainous country, and also much more expensive in outlay and upkeep.

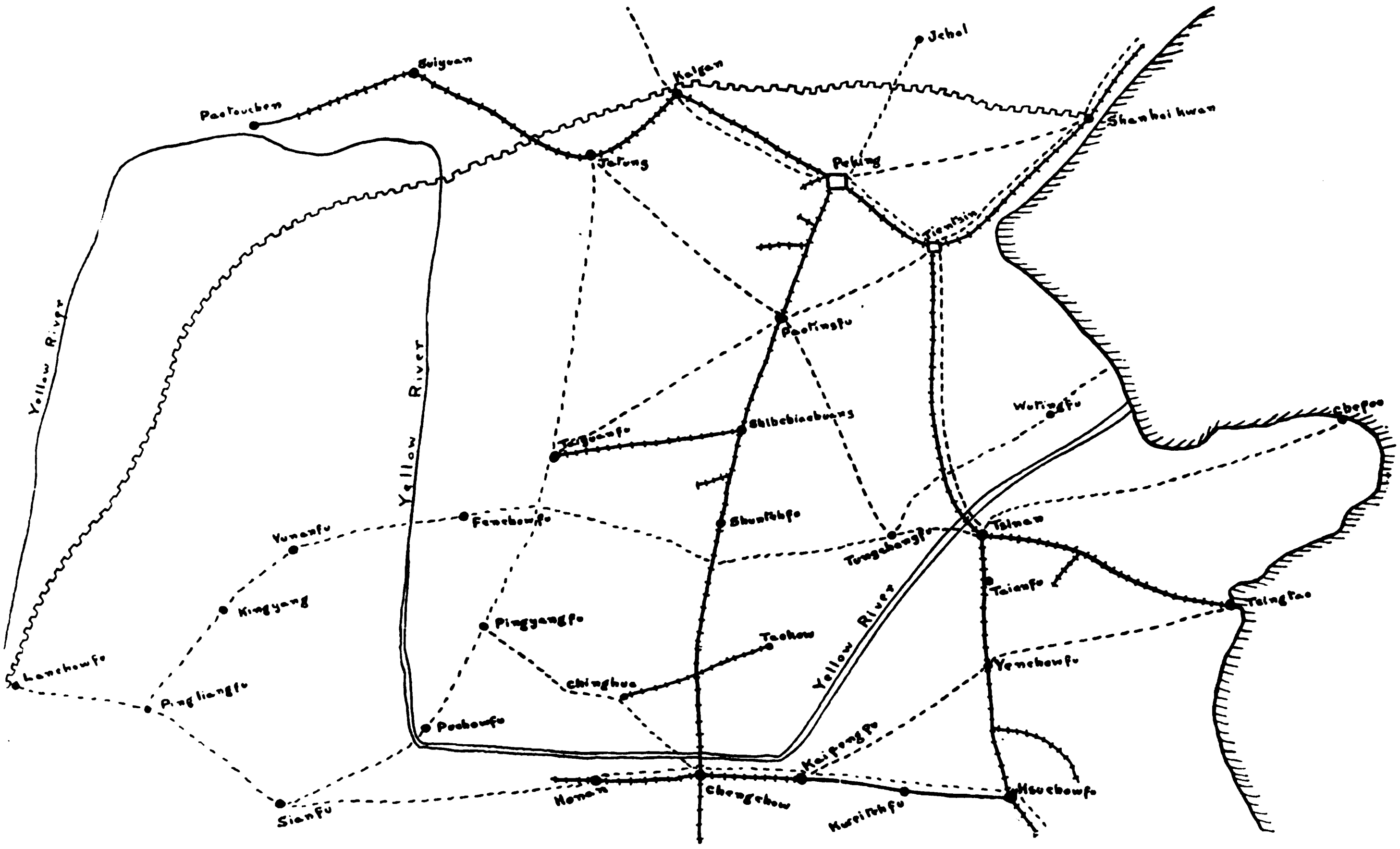
The construction of wells *en route* is comparatively inexpensive, very acceptable to the local population, and a great boon to travelers, while the planting of trees on both sides of the road on the 'berme' will prove of value in retaining the road shape, particularly in sandy country, as the road level should be raised some four or five feet above the surrounding terrain wherever there is any danger of floods. (see Diagram 2)

There is no doubt that the present cart traffic must be kept to side roads as the narrow tyre on the country cart is a most destructive instrument, and moreover the twenty-five-foot road is only sufficient for automobile and pedestrian traffic.



Total Right of Way 50'0" (except for large Embankments)

It will probably be found necessary to allow for more than a fifty-foot right of way in those places where an old road is traversed, and there is no alternative right of way for cart traffic to follow, but in the main I have found the construction as indicated



ROADS AND RAILWAYS OF NORTH CHINA

Railway existing
Roads proposed

in the section appended quite sufficient for engineering needs.

The necessary funds for maintenance work could be obtained by a system of tolls under provincial control, licence taxes on all automobiles, which must be registered, and would be taxed by dead weight or horsepower ; both of these methods of finance being subject to inspection and supervision by the headquarters bureau from time to time.

It is a fact which has been amply proved in other countries that the use of motor transport is very destructive in its effects on roads, and there is thus considerable outlay in upkeep, but on the other hand the initial cost is small compared to that of railway construction, and in China the repair work is chiefly a matter of the right use of manual labor, of which there is an abundance.

A certain number of workmen might be maintained by the provincial or the headquarters authorities, but repair work could be better carried out by the villagers through whose territory the road passes, as it would only necessitate a few days work per annum.

This brings us to the consideration of the question of labor for the initial construction work, and here I hope that a solution of one of China's greatest difficulties can be found, the absorption of her supernumerary coolie soldiers.

All the provincial governors, with the exception of the *tuchun* of Shansi, who has only a small force, well under control, are complaining of the lack of funds to pay the armies within their respective jurisdictions, and I believe that if the soldier once sees come real money within his reach he will be only too willing to work at any task to which he may be assigned.

A large body of men can be thus employed for some years, and the resulting prosperity and industrial activity will be such that at the end of this period the labor employed on this work can be easily absorbed.

One point cannot be over emphasized, and that is the absolute necessity for a satisfactory system of land purchase.

Land is the metaphorical as well as the actual backbone of China, its possession is one of the inalienable rights of the people, and no attempt to benefit the country under the guise of transportation, communications, or any other name, can be successful if it is founded on injustice and official expropriation.

The Chinese famine of 1921 showed that the farming class is far-sighted and open to pursuasion, but no people have a more keen sense of injustice, and it is imperative that, before any work of construction is commenced, an agreement with the inhabitants of the countryside through which the road passes shall be reached.

Land purchase could best be arranged by a valuation committee composed of representatives of the government, the local magistrate, the local gentry, and the farmer concerned ; and the land could be either purchased outright, or the payment spread over a term of years in the form of rent received annually, the land to be the property of the state on the completion of the payments.

With regard to construction costs, some scheme of debentures or bonds would prove possible, and would be taken up by Chinese banks or foreign organizations if the security could be assured, in fact in the South of China some companies are in process of formation for the purpose of building local roads and developing motor traffic thereon.

It might prove possible to arrange for some surplus from the maritime customs surtax to be devoted to this use, subject to proper supervision, or the group of bankers forming the consortium might be induced to take financial interest in this new development of communications in China.

The establishment of a responsible department in Peking who will be prepared to draft plans, make surveys, select the routes, appoint the necessary engineers, and handle the financial arrangements both with the provincial authorities and the bank or banks who hold the bonds, will undoubtedly go far towards establishing the confidence of the outside world in the government who has the foresight and patriotic spirit to initiate this scheme for the welfare of the country.

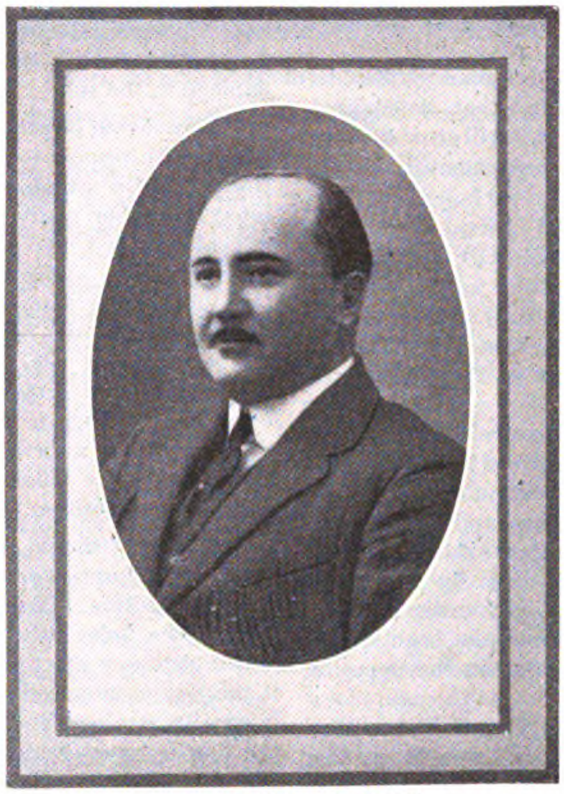
The Future of the Motor Lorry

Interview with Sir Raymond Dennis, K.B.E.

SIR Raymond Dennis, managing director of Messrs. Dennis Bros., Ltd., the well-known manufacturers of motor-lorries, has just completed a world-wide tour of inquiry into the position of British industry abroad, which occupied twenty months and covered practically all the chief fields for the consumption of British goods. India, Ceylon, Burma, the Federated Malay States, Dutch East Indies, China, Japan, Australia, New Zealand, were in turn visited, and, lastly, the chief South American countries—notably Peru, Chile, the Argentine republic, and Brazil, where more than ever British trade is exposed to severe and successful competition.

At a period in British industrial history of exceptional difficulty the conclusions of a man of Sir Raymond Dennis' grasp and penetration are invaluable, and in an interview with a representative of the *Mining Journal* Sir Raymond was good enough to summarise the views formed during his tour.

The general outlook in regard to British industry, Sir Raymond thinks, is a matter neither for optimism nor pessimism, but for a sane appreciation of economic facts. Everywhere abroad there is a desire to resume and extend trade relation with Britain, the business methods of the Englishman no less than the quality of his goods inspiring confidence everywhere. But owing to the cost of production in this country, and the situation created by the foreign exchanges, prices have been screwed up to a level beyond the purchasing capacity of the foreign consumer, and it is certain that reductions in wages and the price of raw materials are absolutely essential if Britain is to regain control of foreign markets. Foreigners are as anxious as ever to purchase our goods, the high quality of which in the long run making them remunerative even at the higher prices, but the economic position of the civilized world at the present time is exceptional, and the most essential point to consider at present is cost.



Sir Raymond Dennis, K.B.E.

Labor unrest, due to unemployment, is largely the result of the high cost of our manufactures, and the prevailing discontent has resulted in strikes of such frequency as to gain for this country, throughout the world an unenviable reputation. These unsettled conditions have made it impossible for British manufacturing firms to fix prices or to guarantee delivery in case their calculations should be upset by troubles in the Labor world. Other countries who are not exposed to the same uncertainties are able to give guarantees, and orders naturally go to them. "Only last week," said Sir Raymond, "I heard of orders placed by the Federated Malay States for railway material to the value of £1,000,000 in the United States, and of £500,000 for electrical material on the Continent, because the goods could not be obtained from Great Britain." The enormous depletion of the wages fund due to this condition of things increases unemployment, which in turn adds to the discontent of the working classes, and so the whole thing moves in a vicious circle. Only a reduction in costs can prevent the invasion of the home market by foreign products, as the natural preference of Englishmen to purchase at home is more than neutralized by the great disparity in prices.

"Realizing the necessity of facing the situation, we have decided to market our standard lorry at £850, or £300 less than the highest price ruling a year ago and only £100 above the pre-war level. Of course, this step involves the necessity of writing down the value of our stock very drastically, but it should also mean a revival in the retail trade and extensive re-employment. If matters are to mend, Labor must act in the same spirit, and realize that in any same scheme wages are dependent upon the work done and not upon time spent. Wages in the engineering trade are still only 6s. per week below the highest pre-war rate, and it is essential that there should be a substantial reduction if we are to bring costs down to a competitive level. Another means of bringing this about is by a longer working week, so as to spread the heavy overhead charges over a bigger output."

The proposal that government should guarantee credits for private trading is attended with obvious danger of abuse; among other things, it would tend to promote risky trade speculation. The widespread credits granted by the German banks to all sorts of concerns before the war brought about a very unhealthy state of affairs. "I do think, however," said Sir Raymond, "that any loans raised in this country for the colonies on account of public improvement should be expended in this country, and an assurance to this effect should be contained in the prospectus, while it should be an absolute condition of government guarantees. In this country a wide field for the absorption of British manufactures is furnished by municipal improvements making for economy of working, and the government should unhesitatingly sanction loans for the adoption of large-scale mechanical devices which will be cheap to work; for instance, the substitution of mechanical traction for horses."

Sir Raymond Dennis' chief object in undertaking his foreign tour was naturally to investigate the outlook of the motor-lorry industry overseas, and he has returned with moderate viewa as to the capacity of foreign countries, particularly in Asia, to absorb our output in this class of goods, particularly of the heavier type. The whole question is a matter of the character of roadways and bridges, and in Asia especially, where road-metal is not always available and where bridges are of an exceedingly light construction, the native administrations frequently preferring to build them of flimsy material and renew them frequently, the field is only open to the light commercial vehicle. In many of the mining districts, however, where communication with rail-head is indispensable, particular attention is paid to road-making, and the roads will take the heavy lorry quite easily. In certain mining areas, notably in parts of the Federated Malay States, the discharge of considerable quantities of silt in the operations of placer mining creates a different problem. The gradual silting-up of the rivers raises the level of the beds above that of the surrounding country, with the consequence that the rivers overflow their banks after a heavy rainfall and inundate the country. To

meet this, roads in these districts have constantly to be re-traced, and sometimes villages have to be rebuilt at higher levels. In the neighborhood of Kuala Kubu, in the state of Selangor, roads and houses have, for these reasons, been rebuilt three times. During the war, transport conditions were met with similar to those obtaining in undeveloped countries, and the type of vehicle in service in France will do good service overseas, but weight limitations prevent their being employed in many countries, including some of our own possessions. When the weather is moderately dry, the earth roads are quite good for heavy lorry work, but in exceptionally arid districts they are simply a desert full of dust, which after a torrential downpour becomes a sea of mud.

While in the Federated Malay States, Sir Raymond, at the request of Sir Laurance Guillemard, K.C.B., made a general inspection of the road system, and presented an interesting report, which it is hoped will lead to substantial improvement. At present many of the roads consist of laterite, a crumbling rock of volcanic origin, whose wearing qualities are 50 per cent. less than limestone. The states possess, of course, adequate supplies of granite, and the use of this road-metal, together with the substitution of concrete bridges for wooden structures, would permit the use of the heavier and better-class British lorries and give a strong impulse to development. The existing restrictions on gross load weights practically amount to the exclusion of all but the light American truck, even in many of our own possessions.

"Generally speaking," said Sir Raymond Dennis, "the idea that the overseas market can absorb anything that we make is erroneous. Mechanical transport will grow, but it will grow steadily, not hurriedly, and side by side with road development."

Tire Flaps

THERE is probably no part of a pneumatic tire as little understood or appreciated as the flap and yet its importance can hardly be overestimated.

The use of a correctly designed flap, properly applied in the casing, will insure full and satisfactory service from the tube, while an incorrectly designed flap or improper application of the correct flap is certain to result in damage to tubes, casings and dispositions.

The function of a flap is to protect the inner tube from injury the bead toes and by the rim. This it does by forming a continuation of the smooth inner surface of the casing against which the inner tube inflates from a point above the bead, down across the rim and up to a corresponding height on the opposite bead.

The technical service department of the United States Tire Company in an authoritative statement places herewith at the disposal of tire users simple yet adequate information regarding the correct use of flaps.

In straightside tires for passenger cars the flap is supplied separately since it has been found that "cemented in" flaps such as are furnished in motorcycle tires soon work loose on account of the heat generated by these larger tires and become dislocated to such an extent as to cause tube pinching. The "floating" flaps supplied in all United States tires of straightside type represent the highest development of this product. They are made of several plies of rubberized fabric and are covered on the tube side with a layer of canton flannel which is turned back over each edge and permanently vulcanized to the main body of the flap. The flaps are vulcanized into the concave shape they assume when mounted in the casing and are provided with a round hole in one end and a slot in the other to allow for proper length adjustment. Their edges are "feathered" and cannot chafe the tube.

To fit properly, the flap must reach to a point on the inside of the casing approximately even with the top of the rim flanges. If the flap is so wide that the edges come above this point, the flap edges have been known to cut into the casing, the tube following, resulting in a ruined tire. On the other hand, if the flap is too narrow there is great danger of one or both of these edges being folded under when the tire is mounted on the rim. This will quickly lead to tube pinching.

The foregoing explanation of the proper fit of a flap indicates the reason for supplying flaps to fit each size of tire on every size of rim on which the tire can be used. For example, it should now be evident that a 33 by 4 tire will require a different width of of flap when used on a 32 by 3½ rim (which is 2.312 inches wide) than when used on a 33 by 4 rim (which is 2.688 inches wide.)

Proper Application

The necessity for using a flap in a straightside casing even when this casing is mounted on a solid base rim is apparent. All straightside tires are built with a rim clearance sufficient to assure easy mounting. The result is that when the tire is inflated on the rim the beads lift off the base an appreciable distance. Without a flap there is nothing to prevent the tube from being blown under the bead toes, and as the tire revolves and these beads move up and down, the tube will eventually be pinched. In the case of a transversely split rim the tube will be pinched in the rim opening.

In applying the flap the end having the round hole must in every instance be placed over the valve first and the slotted end last, thus permitting the flap to adjust itself circumferentially. Failure to observe this procedure is almost certain to result in damage to the tube.

Care should be exercised to have the flap centrally and smoothly placed with respect to the beads of the tire when mounting on the rim. A little attention and care at this point of assembly will repay the labor many times. In addition to seeing that the flap is centrally and smoothly placed with relation to the beads the inner centrally and smoothly placed with relation to the beads the inner tube should be slightly inflated. After assembling, pick up the tire and bounce it rather firmly at three or four places, the casing to be held in a vertical position. This will allow the flap and tube to settle into proper position and prevent the flap being left too high in the tire, where it is likely to remain unless the bouncing is resorted to. Continue this operation two or three times, each time inflating the tube (if necessary) until the flap is in its proper position in relation to the beads.

Attention should also be paid to the valve stem. No tire should be mounted unless the valve stem is seated in a free and straight position. No amount of inflating will straighten a valve stem if the inner tube has been assembled in a twisted position. A complete new start should be made to correct this condition, for if the tire is mounted with a badly twisted valve stem, the tube is greatly strained and trouble is sure to result. If one edge of the flap becomes folded trouble is almost sure to result. A flap which is too wide, if applied off centre, is likely to fold over or to stand out so far from the walls of the casing as to permit the tube to be pinched.

DO YOU REALIZE

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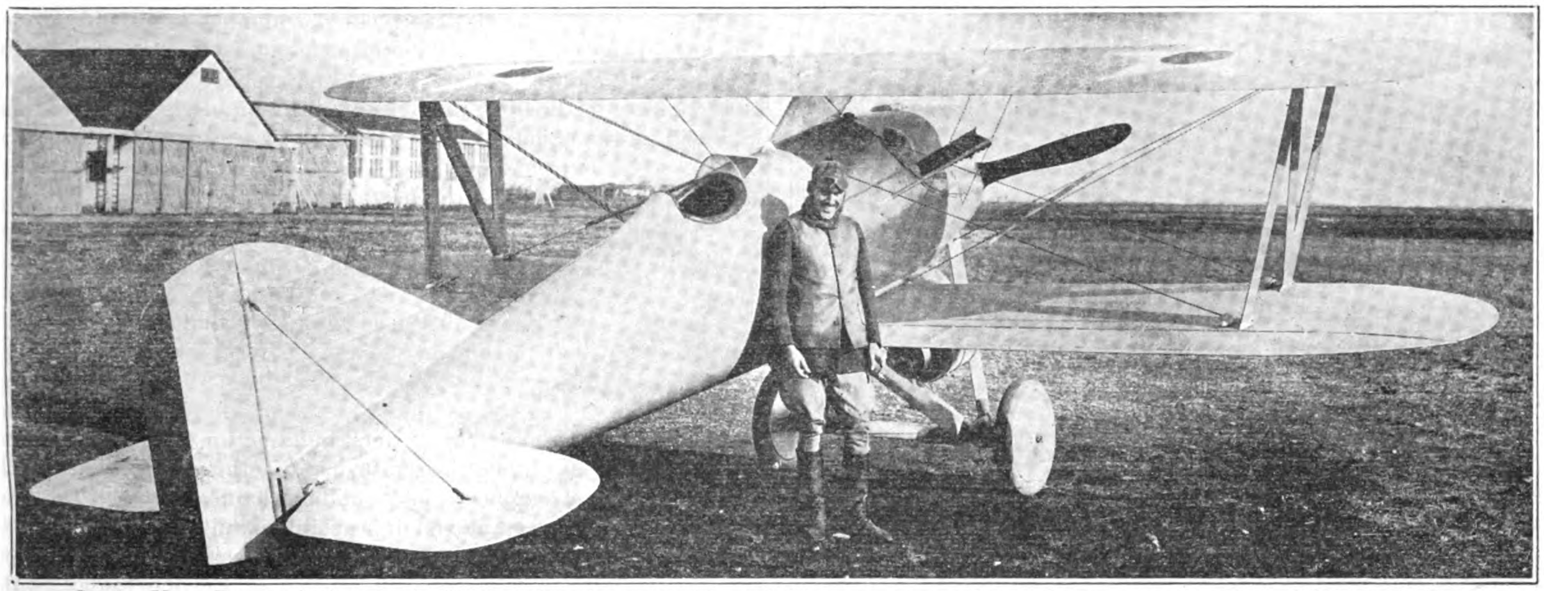
CHINA OXY-ACETYLENE WELDING WORKS

SHANGHAI 1 YUEN-MING-YUEN ROAD CHINA

AIRCRAFT IN 1921



Curtiss Navy Racer which won the Pulitzer Trophy at Omaha, establishing a new speed record for a closed course—176.9 m.p.h. Bert Acosta, the pilot is standing beside the Machine.

(Aeronautical Chamber of Commerce of America, Inc.)

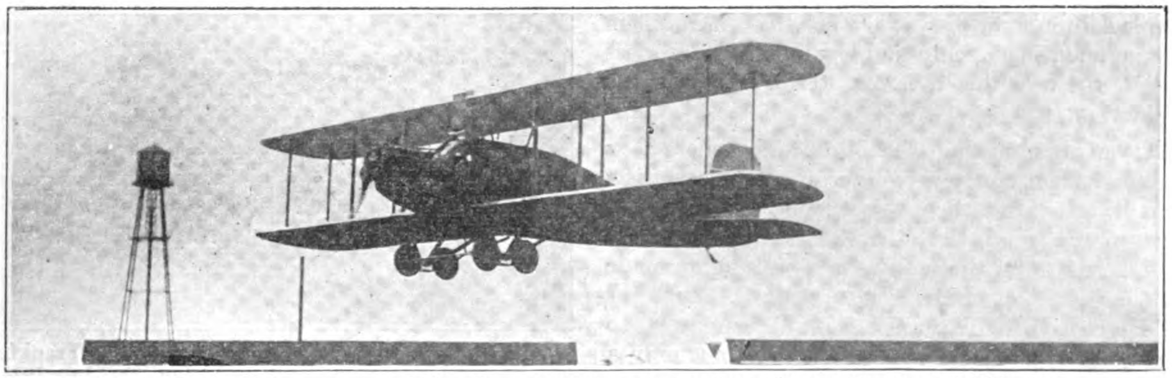
PICTURE an airplane leaving the ground without a human being in it, flying a hundred miles or so until it arrives over its destination, a concentration camp or defenseless city, into which it is sent crashing with its thousands of pounds cargo of high explosives and asphyxiating gases—the entire outfit flown straight to its helpless target, guided and controlled throughout by wireless, says Howard Mingos, in the *New York Times*. Such is the aerial torpedo, not a vision nor the mad idea of a dreamer, but a fact, a product, and only one of the many new things in aviation during 1921.

Imagine a thousand of these engines, two thousand, hurtling out of the skies upon an enemy country, and you have an idea of one grim spectre not absent among others haunting the ordinarily affable sessions of the Washington conference.

It has been a comparatively simple matter to reach an agreement on naval reduction. Navies are expensive. A warship is only a warship, but an airplane is, first, last and always, a carrier, whether it is carrying bombs, passengers or peaceful freight. The subject of aviation has bobbed up now and then at the conference, particularly when the cry of viper warfare is raised, and the flying machine has been added to the list of vipers along with the submarine, liquid fire and poison gas. But while the other vipers have remained vipers and subject to expulsion or suppression, aircraft have been spared.

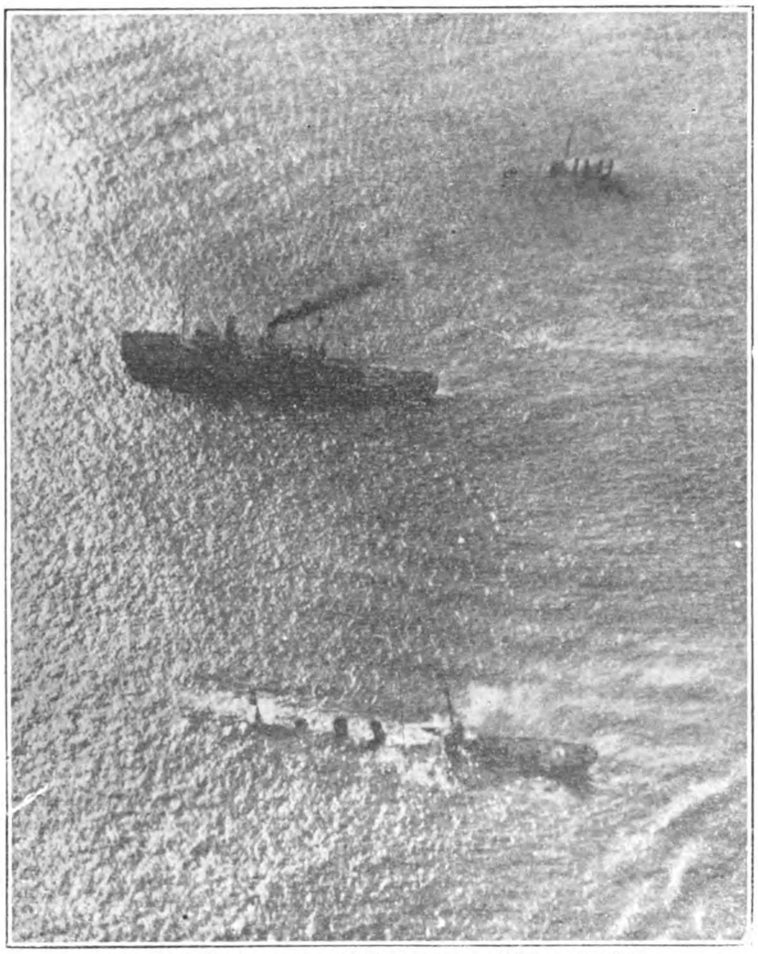
Not that any of the delegates have discounted the importance of aircraft. Technical experts accompanying each of the delegations at the conference have given aviation a great deal of thought. Bearing in mind the aircraft reference in the agenda of the conference, and remembering further the statement terming commercial aircraft potential naval weapons, is it not arguable that one reason they are willing to scrap their navies is because they know aircraft will be decisive factors in any future struggle on land or sea? It was added testimony, but the aerial warfare demonstration off the Virginia Capes last summer surely convinced the naval experts of other nations as well as our own. And yet they might as well go out and limit the peaceful development of the steamship, motor car and railroad as to tamper with the improvement in flying machines.

To one who follows the sessions closely it is clear that Great Britain openly champions aircraft, maintaining that aerial transport is of extreme importance in developing communication and linking together the scattered dominions of the empire. Japan, only now launching her aerial program, is quite content to avoid discussing it, meanwhile buying up all kinds of airplane equipment and materials in every market in the Western Hemisphere. Six weeks ago, American plane manufacturers trying to buy in their own country certain kinds of wood suitable only for airplane propellers, learned that none was available because the Japanese had purchased the entire supply. More recently, however, hardwood producers have circularized American builders, stating that if they intend to contract for airplane wood, now is the time to do it, as the Japanese will not re-enter the American market again until after the first of the year.



Curtiss Eagle—10 passenger. It has flown for 18 hours continuously or a distance of 1,700 miles

(Aeronautical Chamber of Commerce of America, Inc.)



Sinking of Ex-German Ship "Frankfurt," July 18, 1921

(Aeronautical Chamber of Commerce of America, Inc.)

All of which confirms the belief of experts that aviation is not a welcome subject at the present conference. Undoubtedly there will be another conference at an early date to consider aircraft alone.

The technical experts will be called upon to garner all possible knowledge with the aim of formulating, internationally, of course, the most comprehensive project for using aircraft to maintain amity and good-will among all peoples. They will bring out the flying machine, pick it to pieces, rig it up again, analyze its faults and then its potentialities as an agent of destruction. Finally, it may be predicted they will make another agreement, not repressing aircraft as in the case of the floating fortresses of the sea, but so framing a new " live and let live " policy among nations that war will be too terrible a liability, if you please, for the nation precipitating a conflict.

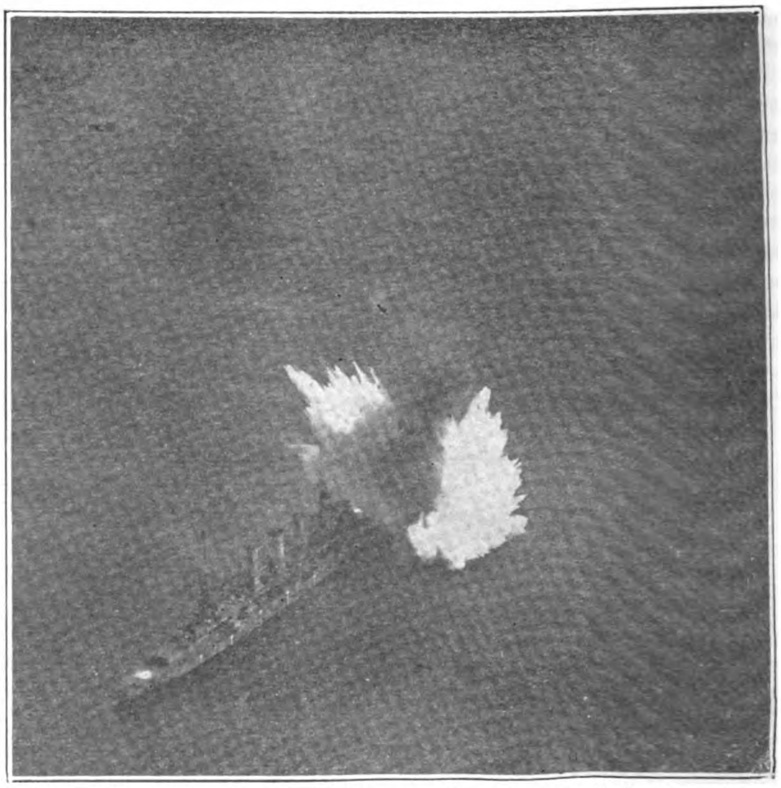
If it is bad form to discuss the possibilities of a " next war," one's excuse must lie in the world situation as it exists to-day and the little realized advancement of the flying art during the last twelve months. Take Germany, for example. Prohibited from building powered aircraft by the allied council under the terms of the treaty, she has found a way out by devoting her engineering ingenuity and technical thoroughness toward solving the problem of soaring flight, experimenting openly and legally with motorless airplanes, "gliders," to use the aviation term. Remarkable success has been achieved.

In soaring flight, you are imitating the birds. The energy, as with the birds, is secured from two sources, according to scientists who have become authorities on the subject; one, by using air currents having an upward trend, the other by taking advantage of irregularities in the wind. Of the many successful flights made in Germany during the year, that of Dr. Klemperer last August was most spectacular. He soared for five miles from Wasserkuppe to Gersfeld, passing over six villages before landing at a spot only a few feet lower than that from which he had started. In the course of his flight he arose 400 feet higher than his starting point. The result of this practice may be the solution of the motor problem, for by fashioning planes that will remain aloft by use of the winds and air currents it would be possible to secure sustained flight and definite direction with a comparatively small, economical motor. When Germany is ready to compete with other nations, hers will be the advantage in having secured valuable knowledge under pressure of national necessity and strict limitations. Nor is it in soaring flight alone that she is progressing, though unable to produce and compete in the open market. Her airship design is improving. She will be the equal if not the superior of any nation when she is ready.

What applies to Germany, restricted as she is at present, might apply to any nation collaborating under a friendly agreement. Thinking cannot be stopped. And if engineers invent devices, their nation is sure to have that advantage in case of conflict. Presumably the next conference, while not limiting aircraft development, will have for its object the recognition of all these principles, and their application to peace only. It will then develop that each great nation is quietly engaged in developing aerial weapons as well as peaceful carriers, building up within its borders, meanwhile, great civilian aircraft manufacturing industries with trained personnel, engineers, pilots and mechanical forces. The new inventions are being employed in peaceful pursuits as far as possible, the heavy bombing machines, for example, being used for civilian transport routes. They literally criss-cross Europe to-day, with junctions at all capital cities. Operated by civilian companies, they are heavily subsidized by their respective governments, because they are the great reserve, the third arm. Aerial charts are being made, wireless communication systems established and laboratories and plants placed in readiness for quantity production whenever emergency demands or public need arises.

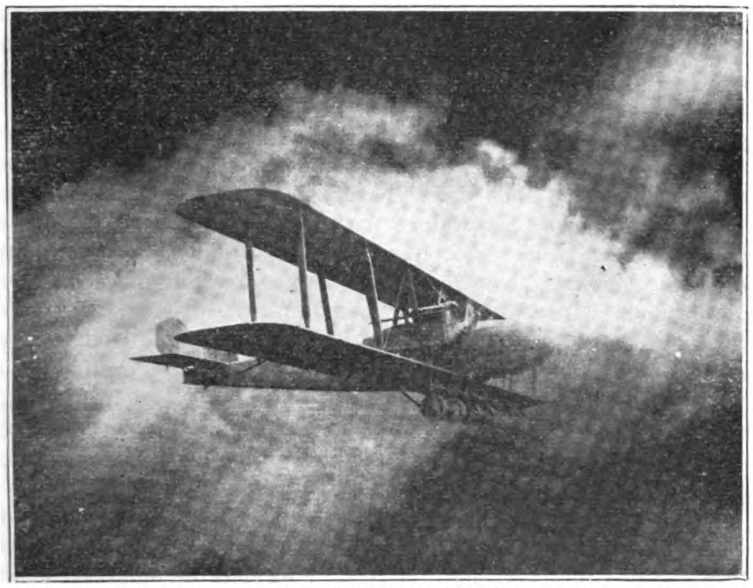
Great Britain, France and Germany, and all the smaller nations, are subsidizing their civilian aerial transport, thus making it possible for air lines to operate daily wherever communication is warranted by civil or military exigencies.

The governments are also aiding manufacturers to penetrate foreign fields, sending missions throughout South America and elsewhere. This system creates a market for the surplus equipment



Bomb Exploding near the Ex-German Ship "Frankfurt" during the Bombing Tests of June and July 1921

(Aeronautical Chamber of Commerce of America, Inc.)



Martin Mail Plane carrying 1,500-lbs. or 40,000 letters between New York and Cleveland. Altitude 10,000 feet at 90 m.p.h.
(Aeronautical Chamber of Commerce of America, Inc.)

discarded for newer planes at home. It enables the manufacturer to survive, and encourages the designer in continued effort. Government and manufacturers work hand in hand in perfecting all sorts of devices for increasing efficiency in peace or war. They all are doing it to the absolute limit of their national finances.

Americans returning from abroad are inclined to point to Europe's air lines as models. They comment on the number of planes seen in the air daily over London, Paris, Berlin, Rome, Copenhagen, Warsaw and other capitals. They forget that in European capitals they are in the very centre of national activity, while in America there are many centres, equally important but scattered over a vast area. If figures were available from abroad we should find that there was probably as much flying in the United States these last twelve months as in any three European countries combined.

Statistics compiled by the aeronautical chamber of commerce show that upward of 275,000 persons flew in civilian aircraft here in 1921. Specific reports were made by 107 operating companies for the aircraft year book for 1922. From these reports, and taking into account the lack of official government machinery for checking the roving gypsy pilot and his equally vagabond plane, it is estimated that 1,200 civilian planes were operated in the United States in that period, an increase of 20 per cent. over the preceding year in civilian flying and number of aircraft operated.

And the government has not been idle. Only two months ago the newspapers announced the invention and successful test of the aerial torpedo mentioned in the first paragraph of this article. It has been flown by radio from Long Island to Pennsylvania. The army air service, naval aviation, marine corps and air mail service, in fact, all the executive branches from the White House throughout the departments, have adhered to the policy of developing aviation to the limit of our engineering and inventive ability.

We have our full share of world's records in aviation. Lieutenant J. A. Macready of the army air service last September reached an altitude of more than 37,800 feet over Dayton, Ohio; parachute drops of from 22,000 to 25,000 feet were made by Lieutenant A. J. Hamilton and Sergeant Encil Chambers. There was the closed course speed record made by Bert Acosta in a Curtiss navy racer at the Pulitzer race in Omaha in November, when he covered a triangular course of 150 miles, including fourteen turns, at an average speed of 176.3 miles an hour—260 feet a second. The Loening monoplane flying yacht with four passengers went up 19,500 feet over Port Washington, L. I. A Martin twin-motored bomber, equipped with the engine supercharger, also an American invention, attained a height of 25,600 feet over Dayton, Ohio. All these are world records of importance and significant of our aerial progress last year. Another noted performance was that of the army airplane, which was stopped within fifteen feet after its wheels first touched the ground by means of the reversible propeller.

Our first national airway was opened between Washington, D. C., and Dayton, Ohio, an event of great importance, because it serves as a model for experiment and is a forerunner of the transcontinental highways which will soon form a network across the country, making it possible for fleets of aircraft to travel unerringly and with maximum speed from coast to coast in safety. There is also the air mail, a model for commercial transport the world over. We are to-day matching other nations, plane for plane, bomb for bomb, device for device.

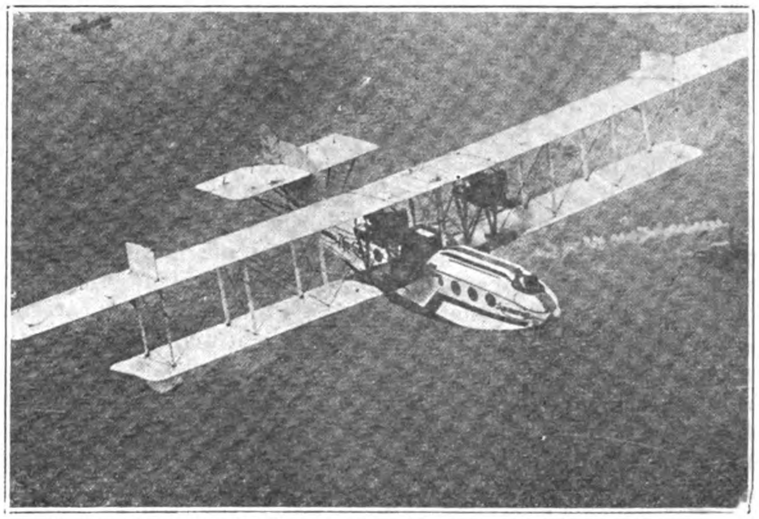
In France they have just erected the most poowerful aerial lighthouse ever known, on Mount Africa, near Dijon, to assist night flying over the principal airways. It is officially said to have a billion candlepower and can be seen by aviators 200 miles away. Here in America, the navy, army air service and air mail service have co-operated in establishing radio stations on the Atlantic Coast and at each of the fourteen principal points on the transcontinental route. Pilots may now keep in touch at all times with weather conditions and by the use of the radio compass, very soon now, pick up their locations at any moment they desire. Night flying is still in the experimental stage here and abroad, the main problem being, not the perfection of direction-finding instruments, but the development of aircraft that will be a positive guarantee against forced landings. While the air mail has maintained better than 88 per cent. efficiency the last year, officials hesitate at present to subject their pilots to the risks involved in night flying. They hope, however, to have the service operating in 1922.

A hundred and five of the larger cities have petitioned the post office department for an air mail service, offering to provide local facilities. It is pointed out that night flying with the mails would save thousands of dollars daily in interest, and exchange on banking and commercial paper. The bankers of Kansas City, Mo., recently estimated that if mail could be flown from their city to St. Louis every night, they would save as least $4,000 daily. Similar saving can be effected elsewhere.

The fire peril has been eliminated from mail planes, through improvements made by engineers attached to the service. New machines recently placed in operation have repeatedly carried mails from the Pacific to the Atlantic in forty-eight hours.

Then there is the forest fire patrol, 41 army airplanes, making a total of 396 patrols in 1921, protecting more than 7,000,000 square miles of valuable timber lands in the national forests on the Pacific slope. Observers in these planes discovered 832 fires in that period. These were extinguished before material damage had resulted.

The completion of the world's largest airship hangar at Lakehurst, N. J., last Fall, was followed quickly by the erection there of a mooring mast for American fighting dirigibles. The United States Steamship *Langley* was turned over to the navy as an



Aeromarine West Indies Airways Passenger Mail Boat Between Key West and Havana, Cuba
(Aeronautical Chamber of Commerce of America, Inc.)

aircraft carrier shortly after successful tests at Philadelphia had demonstrated the practicability of launch'ng aircraft from ships by means of a catapult. Both the Atlantic and Pacific fleets have been augmented by aerial fleets composed of scouting, combat, spotting, torpedo and bombing, and kite balloon squadrons.

Rear-Admiral Moffett, chief of the naval bureau of aeronautics, in his annual report, asserts that the real significance of the catapult lies in the fact that it is now possible to provide all ships with fighting airplanes. Another interesting development, and most important, is the production of helium. The C-7 navy airship was flown over Washington recently just as the delegates and technical experts were leaving a session of the conference.

" That is the first public flight of an airship filled with helium, the non-explosive gas," explained Admiral Moffett to a foreign visitor at his side.

" Yes, and we know only too well that helium is available at present only in the United States," replied the other. " It is, as you Americans say, that you have a corner on it ? "

Which is a fact. A by-product of certain kinds of gas found in the southwest, helium offers untold possibilities in lighter-than-air development. It is almost as efficient as the dangerous, explosive hydrogen. Had the Z R-2 been inflated with helium the airship would not have exploded. During the war the government built a great helium plant at Fort Worth, Texas, spending millions on it. The plant has just been placed in quantity production, so that American military airships may fly safely under better conditions and with less risk than those of other nations.

Many improvements were made in the design of airplanes and in the internal combustion engine. Motors were made more reliable. They have become more economical in fuel consumption and more efficient. Several new types are being developed—radial, air-cooled and steam. It is not beyond the limits of possibility that the new year will witness the production of the steam engine for airplanes. Meanwhile the internal combustion motor is being enlarged. The army air service has had one under test at McCook Field, Dayton, Ohio, which develop 700 horse-power, so far the most powerful in this country and the equal of any abroad.

McCook Field is the experimental station of the army air force, just as League Island, Philadelephia, is the scene of naval aviation research. There work was started last year on the Z R-1, sister ship of the Z R-2, and reports indicate that it is being completed. It will be one of the most powerful airships on earth, literally bristling with weapons and capable of cruising from New York to San Francisco and back again without stopping. It, as well as the German airship to be delivered to the United States in 1922, could very likely cross the Pacific Ocean. Then there is the navy " Giant " flying boat under construction at League Island. The hull has been nearly completed. The power plant consists of three units of three Liberty motors each. Each of these units of three motors drives an eighteen-foot propeller, giving the machine three of these great air screws for propulsion. The power plant was perfected and tested successfully by Edson Gallaudet during the last six months. It may go a long way toward solving the problem of continuous flight in large craft, because the use of three engines to one propeller permits one of them to be held in reserve and thrown into action by a multiple gear system, if one of the others develops trouble.

Aided by the government in securing surplus war planes at greatly reduced figures, many commercial air lines have been established. One company reports that in 1921 its fleet of fifteen flying boats flew approximately a hundred thousand miles, carrying 6,814 passengers and 29,002 pounds of freight and mail on routes extending from Key West to Havana, Cuba, and ports along the Atlantic Coast. Within the year at least a half-dozen new types of over-water flying craft have been produced, generally under the supervision of the navy department. At least two of these are amphibious, capable of alighting on and leaving water or land.

The organized air forces, the regulars, are kept busy, aside from war training, patrolling and charting coast lines and the many unmapped regions in the United States and its island possessions.

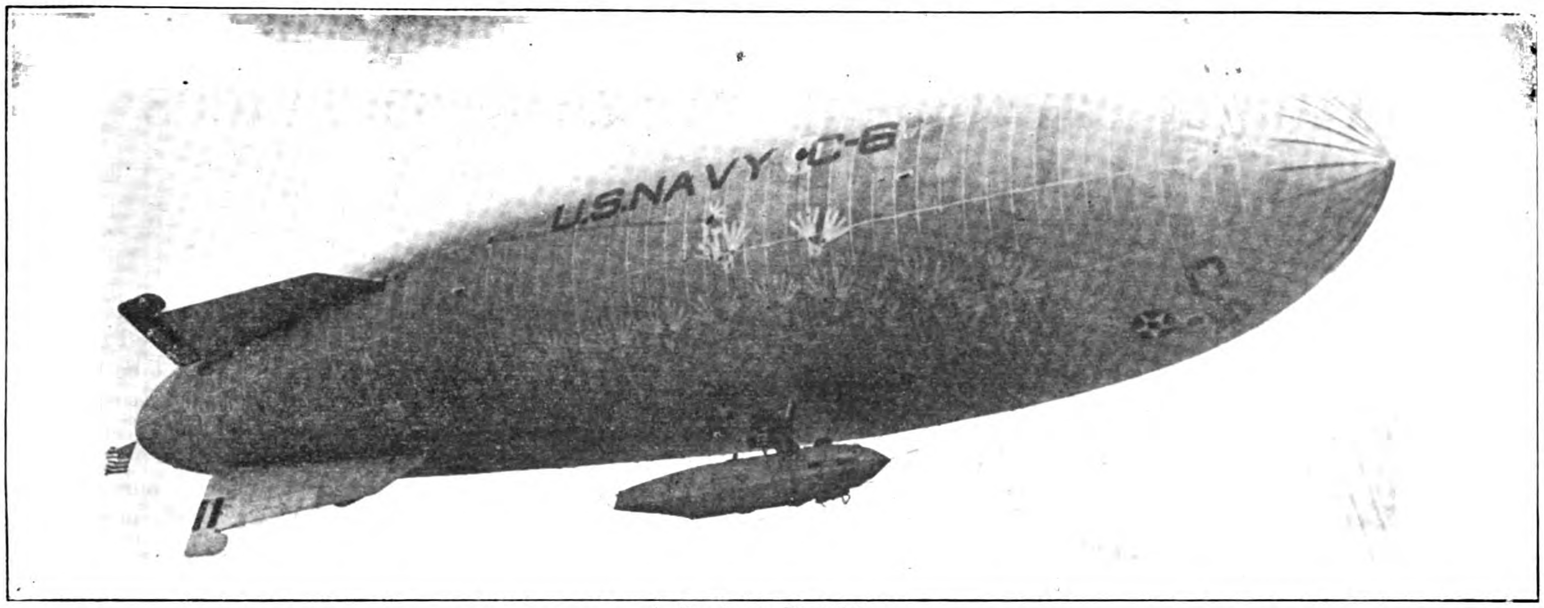
Early in 1919 Great Britain organized her air ministry to work out the plans formulated by the civil aerial transport committees during the war. Even in the midst of the great struggle British statesmen recognized the importance of aviation and the part it would play in international relations. It was determined to unite the empire by air routes and air forces. The soundness of that idea has since been proved. Throughout the dominions air forces are being maintained with up-to-date equipment, all the result of continuous research, experimental and practical development in England. Nothing in the field of aerodynamical research is too trivial or impossible for the air ministry to undertake. For the attainments which have kept British well in the lead of other nations credit is due the air ministry, with its co-ordination of civil and military aerial activities. This may account for the large number of aeronautical experts accompanying the British delegation to the conference in Washington. There were as many aviation experts from London as from all the other countries together.

The air ministry has found its counterpart in France, Italy and Germany, though the organizations are not identified as ministries. Since the war there has been considerable agitation in the United States for and against the creation of a separate department of aeronautics. It was even proposed to create a ministry of national defense, with war, navy and air co-equal in importance. Various elements in the controversies which occurred with fair regularity and whenever the subject was publicly discussed have been definitely united during the last year, however ; and it is now the prevailing opinion of the administration, aviation experts and the chiefs of the score or more of federal bureaus dealing with aviation, that the best intersts of the flying art will be served by the establishment of a bureau of civil aviation in the department of commerce. A bill for providing for such a bureau is now in congress.

Aside from duties solely domestic, and of local importance only, such as enforcement of air law and registration of aircraft and pilots, the bureau of civil aviation will be charged with developing America's aviation reserve strength and maintaining it for mobilization with the army and navy air forces. By that is not meant the national guard, but the civilian transport and the industry at large. It may be seen from this that civil aviation has become officially identified with our policy of national preparedness and that this will be recognized in the organization of the bureau. Being part of national preparedness, it is also a unit in our national defense. Just how important a unit it will become depends upon the decisions of the next international conference.

Lighthouses for Airmen

IN spite of many difficulties speedy progress continues to be made in the organization of transport services by aeroplanes in Great Britain. One of the most important elements in a regular service by aeroplane, especially during winter months, is the provision of adequate light to guide the pilots. Several aerial lighthouses are accordingly being established to enable the services between London and Paris to be maintained without interruption. Two lights are already in operation. Each lamp gives a powerful vertical and horizontal beam and also a distinguishing signal visible to an airman for many miles. The foundations have been laid of another aerial lighthouse which will have a flash light of 56,000 candle power visible under normal conditions for a distance of 32 miles. Another even more powerful light will shortly be added ; and when all the lighthouses are in operation regular night services will be established. In connection with British aviation enterprise it is worth noting that there has been a steadily increasing use of the air mail service between Cairo and Baghdad. The average time of transmission by ordinary mail between London and Baghdad is 27 days, but when letters are transmitted from Cairo to Baghdad by air the average time is 12 days and on several occasions the period has been reduced to 10 days. Owing to the success of the service the mail fee has been considerably reduced.



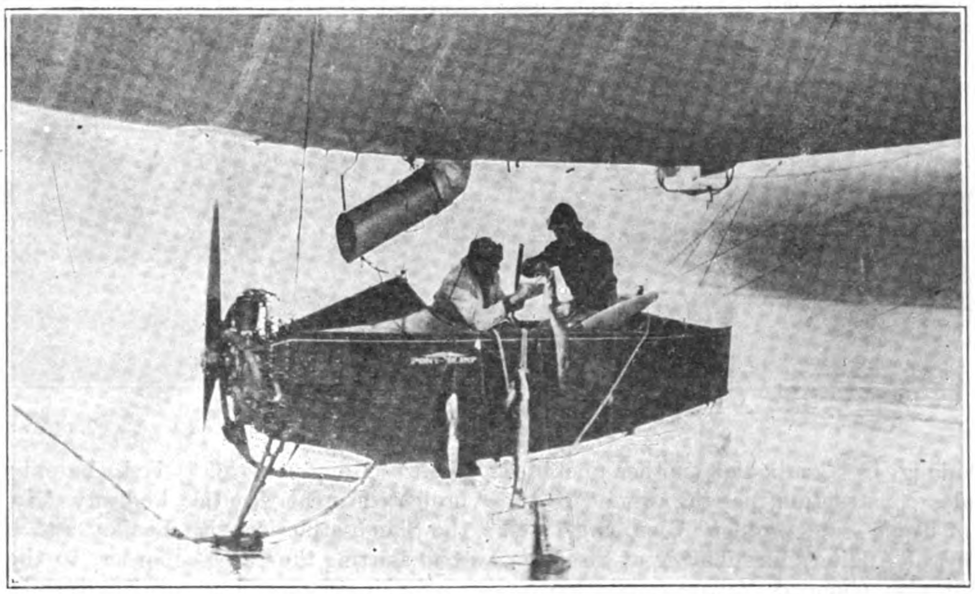
A Goodyear Dirigible

Blimps for Asiatic Exploration

WE are living in a wonderful, advanced age, in which the marvelous development in aviation, during the past few years, has taken place. We are in the habit of thinking of aviation as an entirely new thing, a strictly twentieth century creation. Little do we realize that as far back as 1306, the Chinese understood the laws of ballooning. It is reported that an ascension was made in Peking, China, on the day of the coronation of the Emperor Fo Kiers. Ever since those early days, there has been a slow progress made to master the air, and we find ourselves in the beginning of the year 1922 thoroughly familiar with aviation.

After the past ten years of experimental work in the manufacture and operation of all kinds of dirigibles, we feel confident that it will be the coming method of traveling. Aerial transportation is here and will remain forever.

We have built and flown dirigibles over all parts of the country, over mountains, deserts and oceans, and under all kinds of conditions, heavy winds, snow storms, rain storms and in sunshine, and they have proven to be capable and worthy under trying conditions. They are especially valuable for exploring the interior of jungles and other desolate places, into which there is no other means of transportation. We have used these ships successfully for forest patrol work, as they can land in small openings and discharge passengers, and fire fighting apparatus to combat the flames.



Great Sport. Fishing from a Goodyear Pony Blimp

These ships are also very useful in the transportation of mining material to and from mines, where other means of transportation are impossible, or very crude. They have been used successfully in engineering work for flood control and surveying as well. They have a cruising radius up to 3,000 miles and a carrying capacity from one to 20 tons. For further information enquire of the Goodyear Tire & Rubber Company of California, Los Angeles, California.

New Roads, Siam

WE are told that a project is under consideration for the construction of a main road in Siam from the extreme north of the country to Bangkok, suitable for heavy motor traffic. It is also proposed to build a branch road from the main thoroughfare running from Lampang to Chiengmai connecting this thoroughfare with Sawankalog, and eventually to build a trunk road down to Nakorn Sawan and Paknampoh.

Plans are also in progress for bridge work in addition to that of railway development, and contracts may be anticipated in the near future for concrete bridges along the chief trade routes crossing rivers. Many of the existing wooden bridges are in a ruinous condition and schemes are being put forward to replace them with reinforced concrete structures.

With a view to realization of the foregoing projects renewed attention is being given to the discovery of petroleum in the Muang Fang and Chiengmai districts where the government is at present carrying out experimental boring. A certain amount of private prospecting work has already been done. In regard to minerals as well as oil, expectations are also entertained. Geological examination has proved the existence of iron and coal in north-western districts, while gold, tin and antimony have also been found. Plans for more scientific methods of research are now being considered.

Roads and Automobile Services in Indo-China

THE total length of government highways, projected or under construction in Indo-China at the end of 1920, was 8,372 kilometres, distributed as follows : Tonkin, 2,162 kms., Annam, 2,518 kms., Cochin-China, 80 kms., Laos, 1,770 kms., and Cambodia, 1,112 kms. The local roads in the various provinces in the colonial union now open to traffic form a ststem of 16,395 kms., of which 4,026 are macadamized. Tonkin enjoys the greatest development in local roads with 5,280 kms. followed by Annam with 4,874 kms. In Cochin-China, the present provincial or local road system has a length of 1,415 kms. A comparison of the present highway system of the colony with that of 1912, will show something of the construction work carried out during this period resulting in a doubling of the entire mileage and with nearly 7,000 kms. of new metalled roads.

1912 : 2,831 metalled ; 10,609 dirt ; 131 in construction ; Total, 13,571 kms.

1920 : 9,842 metalled ; 8,557 dirt ; 8,445 in construction ; Total, 26,484 kms.

A glance at the road map of Indo-China which illustrates this article, will show that within a short time Saigon will be connected with Siam by a macadam road (No. 1) passing through Pursat and terminating at Sisophon, with a dirt road extension to the frontier. A macadam road (No. 16) also connects Saigon with Baclieu passing through My-tho, Cantho and Soctrang, with a dirt road extension to Camau at the tip of the peninsula. Another macadam road (No. 17) connects Pnom-Penh, the capital of Cambodia, with coast, passing through Kampot and terminating at Hatien. From Oudong in Cambodia another metalled highway (No. 1 bis) is under construction, passing around to the north of the Great Lake of Tonle Sap, through Kompomg Thom and the world famous ruins of Angkor, terminating at Sisophon. A macadam road (No. 15) also connects Saigon with Cap St. Jacques ; another (No. 13) with Loc-ninh. This last is to be extended to Stung-trang via Kratie and Sambor.

The mandarin highway (No. 1) connecting Saigon with Hue and Hanoi is metalled throughout except for the short distance between Phan-thiet and Phan-rang. It is, however, possible for vehicles and automobiles for its entire distance. The Mandarin Road, it will be noted, starts at Langson, the Gate to China, and follows along the coast through Hanoi, Hue, Saigon and continues west through Pnom-Penh to Sisophon, to connect ultimately with the Royal Siamese Highway to Bangkok. It is the backbone of the colonial road system connecting all, the capitals of the various petty states, a veritable king's highway, along which, in the not distant past, passed in Oriental pomp and splendor, the embassies and missions of the kings of Cambodia, Cochin-China, Annam and Tonkin on their way to pay tribute to their overlords at Peking. With the completion of the Saigon-Sisophon road and the Siamese highway from the frontier to Bangkok, it will not be long before auto enthusiasts will be able to motor through these picturesque lands to the Malay peninsula and down to Singapore, undoubtedly one of the greatest scenic routes of the world.

From Phan-thiet and Phan-rang on the main mandarin highway, macadam roads (Nos. 11-12) lead to Fimnon and there unite to continue further up into the high lands to the Dalat sanatorium, the great health resort of southern Indo-China. From Loc-ninh on the Cambodia-Cochin-China frontier runs a dirt road (No. 14) which will be converted in time into a metalled highway connecting Saigon with Tourane, passing through the high lands of Annam inhabited by the semi-savage Mois.

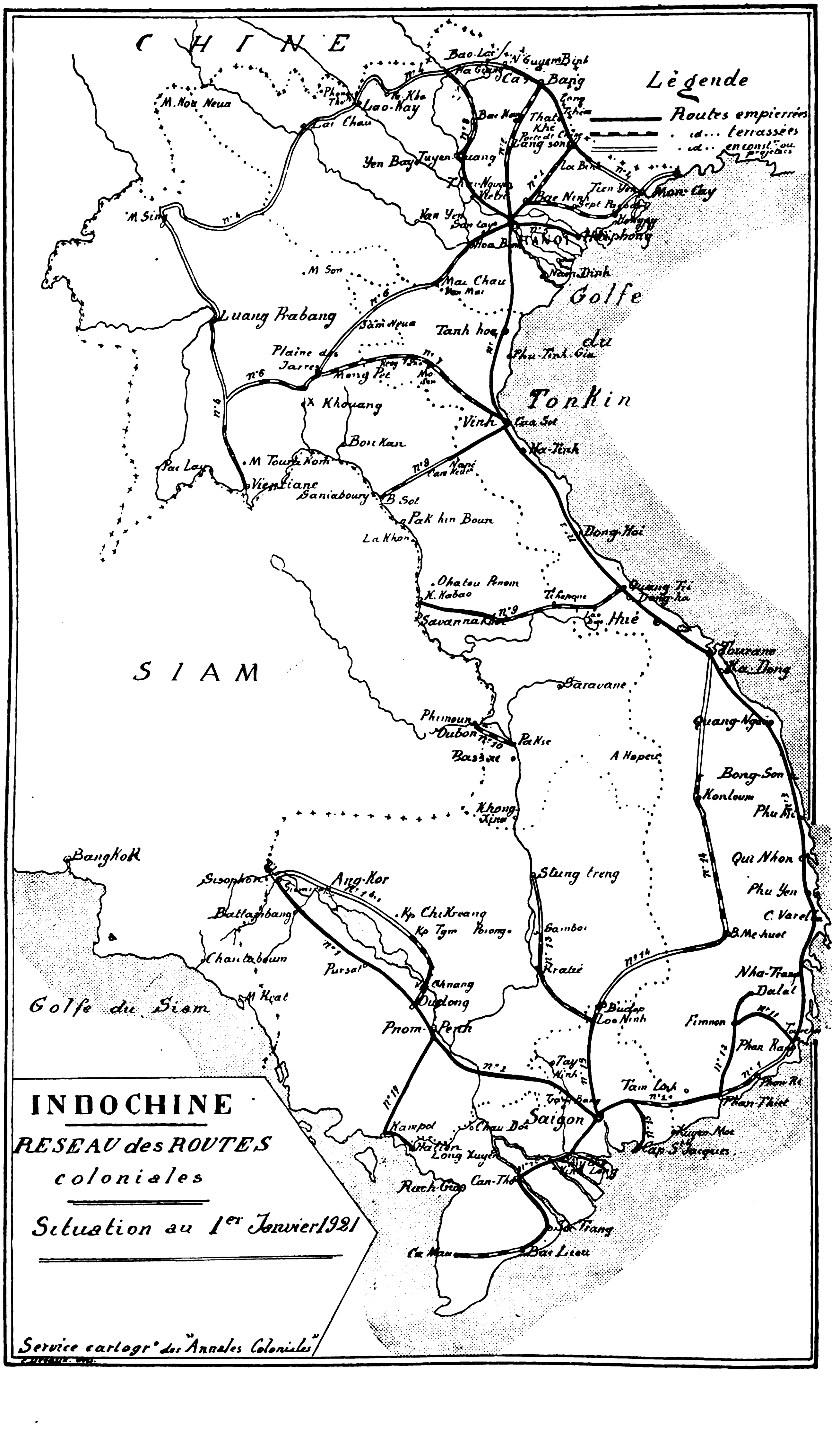
In Tonkin, we find macadam roads connecting Haiphong with Hanoi (No. 5) ; Hanoi with Langson (gate to China) (No. 1) metalled for about two-thirds of the distance ; from Hanoi to Caobang (No. 3) passing through Thai-Nguyen and Bac-Kan ; from Hanoi to Ha-Giang (No. 2) metalled as far as Tuyen-quang ; from Bac-Ninh to Moncay passing through Hongay and Tien-yen; and the frontier military road (No. 4) from Moncay through Langson, That-Khe, Caobang, Bao-lac, Ha-Giang to Laokay.

The roads for the development of the Laos country consist in the one from Quang-tri to Savannahket passing through Tchepone (No. 9) which is metalled for one-half its length ; the road from Vinh to the Mekong River (No. 8) is metalled as far as Nape. Construction on the section from this point to the Mekong is now under way. The road from Vinh to Mong-pet (No. 7) is to be extended to connect with the projected great frontier highway (No. 4) linking Ventiane on the Siamese border with Loakay and the other leg of the frontier road skirting the Chinese border, to the sea at Moncay. Another road will start at Mongpet (No. 6) and connect with Hanoi through Moa Binh. There is another short horse road (No. 10) in southern Laos connecting Pakse with Phimoun on the Siamese border.

A Renault Autobus in operation at Hanoi, Tonkin

All the above roads are maintained under an appropriations of the colonial government and their enumeration gives some idea of the possibilities for the expansion of the automobile business in a country one and a half times larger than France having 5,500 kilometres of good roads over which automobiles can operate at all seasons of the year.

The first automobile was imported into Indo-China in 1902 by Mignot Freres, bicycle dealers of Saigon. At the end of 1920, there was 1,730 machines in the colony ; in Laos, 14, in Cambodia, 120, in Annam, 138, in Tonkin, 400, and in Cochin-China, 1,058. Of this total, 195 were employed for public transportation, 75 are motor trucks and more than 1,450 touring cars of all classes.


CHINE
Légende
Routes empierrées
. id... terrassées
. id.. en const. ou projetées
Golfe du Tonkin
SIAM
Golfe du Siam
Lao-Kay
Lai Chau
Yen Bay
Cao Bang
Lang son
Mon Cay
HANOI
Haiphong
Nam Dinh
Luang Prabang
Tanh hoa
Vinh
Vientiane
Dong-Hoi
Quang-Tri
Savannakhet
Hué
Tourane
Saravane
Paksé
Bassac
Quang-Ngai
Bong-Son
Kontoum
Qui Nhon
Phu Yen
Nha-Trang
Dalat
Phan Thiet
Bangkok
Sisophon
Ang-kor
Battambang
Chantaboum
Pursat
Pnom-Penh
Stung treng
Kratié
Saigon
Kampot
Can-Tho
Bac Lieu
Ca Mau
Cap St Jacques
INDOCHINE
RESEAU des ROUTES coloniales
Situation au 1er Janvier 1921
Service cartogr. des "Annales Coloniales"

Public Automobile Services in Indo-China

TONKIN

1. Haiphong to Doson, 25 kilometres.
2. Dong-anh, Thai-nguyen to Bac Kan, 141 kms.
3. Phu-Tho to Tuyen-quang, 60 kms.
4. Vinh-Yeh to the High Altitude Station of Tam-Nao (from May 15 to October 15) 25, kms.

ANNAM

1. Vinh to Dong-ha, 293 kms.
2. Tourane to Qui-Nhon, 300 kms.

COCHIN-CHINA

1. Saigon to Tay-ninh, 100 kms.
2. Saigon to Cap Saint-Jacques, 124 kms.
3. Saigon to Thudaumot, 36 kms.
4. Saigon to the Cambodian Frontier (Pnom-Penh line, terminus at Banam), 200 kms.
5. Various interior services ; Saigon-Gocong ; Gocong-Mytho : Tay-ninh to the Cambodian frontier ; Vinh-long to Travinh ; Vinh-long to Sadec ; Cantho-Long-xuyen ; Cantho to Vinh-long ; Soctrang to Bac-lieu ; Bac-lieu to Camon ; Chaudoc to the Cambodian frontier.

CAMBODIA

1. Saigon to Banam (part within Cambodian territory), 105 kms.
2. Pnom-Penh to Battambang and Sisophon, 306 kms.
3. Pnom-Penh to Kampot, Kep, Hatien and Giang-thanh, 248 kms.
4. Pnom-Penh to Chaudoc (within Cambodian territory), 138 kms.

Details of Principal Automobile Services

A. *Krongpha-Dalat ;* Leave Krongpha, Saturdays at 7.30; from Delat, Saturdays at 14.15, on Monday at 12.15; Duration of trip, 4 hours. Provisional Service (4 passengers or less) at any time. Other day : leave Krongpha at 7.30 and Dalat at 12.15.

B. *Automobile Service of E. Planchais of Travinh ; Travinh to Tiencan ;* two round trips daily.
Travinh to Tracu : two round trips daily.
Travinh to Olac : two round trips daily.
Travinh to Vinh-long : one round trip daily.
Vinh-long to Sadec : two round trips daily.
Vinh-long to Chomoi : one round trip daily.
Travinh to Macbat : six trips weekly, time 20 hours.

C. *Thudaumot to Laithieu :* Postal service, four round trips daily.

D. *Thudaumot to Honquan and Locninh :* three services weekly.

E. *Phnom-Penh to Kep :* two round trips weekly, time about six hours.

F. *Phutho to Tuyen-quang* (Sanguet's Service) : one round trip daily connecting with trains. Time about 2½ hours.

G. *Vin-yen to Tam-dao* (24 kms.) : two trips daily connecting with Hanoi trains and with chair porters for the summit.

H. *Dong-Anh to Thai-Nguyen* (56 kms.) : two trips daily.

I. *Haiphong to Doson* : Regular service. Fare, Pias. 1.25, round trip, P. 2.00.

J. *Vinh to Dongha* (203 kms.) : (*a*) Subsidized service daily. (*b*) Societe des Transports Automobiles ; three round trips weekly stopping at Donghoi over night. Tariff, .02 per kilometre-autobus.

K. *Tourane to Quinhon* (322 kms.) : Subsidized Service of Leroy, Tutier & Co., of Tourane, concessionaires. Regular service. Time, 12 hours 30 minutes. Tariff, first class, Piasters 25.75 ; 2nd class, P. 16.10.

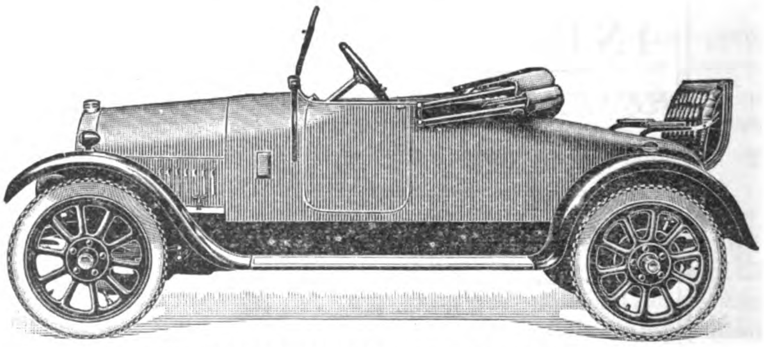
L. The Establissements Claudius Perrin, of Saigon, operate a passenger autobus service in that city. The machines are of the same type as are used in Paris but smaller and have pneumatic tires, giving greater comfort and less wear on the roadway. They have four autobuses and operate two lines of passenger service within the city and charge a fixed fare of ten cents (silver) for the trip of about twenty minutes.

Humber

The First Consideration

NOW more then ever the choice of a new car turns largely upon the questions of first cost and economy of upkeep. In these respects a HUMBER may challenge comparison, for in view of the exceptional quality of materials used and the studied perfection of every detail of construction, the first cost of a Humber model is undoubtedly reasonable ; while the testimony of Humber owners is unanimous as to the low cost of upkeep. Convincing proof of this can be supplied to any intending purchaser who will write for illustrations of the latest 10 H.P. and 15.9 H.P. models.

Full particulars on request



10 h.p. Four-Seater (R.A.C. Rating, 11.4 h.p.)

HUMBER LIMITED

WORKS

COVENTRY, ENGLAND

Japanese Aviation

AIRCRAFT manufacturers should follow closely the developments in Japan, as considerable activity along the line of airplane construction indicates an increasing demand for such means of communication and possible opportunities for sale of airplanes.

The establishment of an aerial training school in Nagoya and the organization of the Lake Aerial Excursion Co. is contemplated by a civilian aviator of Kyoto. The latter is planning a visit to the United States for the purpose of purchasing a 400-horse-power 8-seater plane.

The reopening of a civilian aviation school at Nagoya, which was temporarily closed, is being planned.

The Mitsubishi Motor Co., at Nagoya, has made progress in the work of manufacturing its new type of airplane, and will soon be turning out complete machines. The company's application for permission to establish an aviation field in front of its works at the port has received official sanction.

A trial flight with an experimental airplane completed by these works, in which a 300-horse-power Hispano-Suiza motor was installed, showed satisfactory results. The airplane was constructed after the plan of a British engineer; while the details of construction are kept secret, it is said to be a high-speed fighting plane, to be known as the Mitsubishi type. The company plans to undertake construction of this type of biplane.

Work has been started by the Aichi Tokei Denki Kabushiki Kaisha (Aichi Clock & Electric Machinery Co., Ltd.) on the construction of a factory in the neighborhood of Nagoya to which the works of the company, now at Atsuta, will be moved. It is expected that the factory will be completed by the end of 1922. The present works are capable of turning out one airplane a month, ofthe Yokosho type; the new factory will have a capacity of 50 planes a month. Besides the manufacture of airplanes for military purposes, special attention will be given to the production of large commercial planes.

The Kawasaki Works of Kobe are contemplating the erection of airplane factories in the Gifu prefecture. Construction was scheduled to be started in November, 1921, and to be completed in the spring of 1922, when 500 workmen will be detached from Kobe to engage in the manufacture of airplanes.

Japan Orders Trucks

THE city of Tokyo has made large purchases of motor trucks recently. The sewage department purchased 35 Ford one-ton trucks, which will be fitted with covered stoke bodies of special construction. The same department also purchased 12 Packards, the EC two-ton model, eight of which will be fitted with dump bodies and vertical hoists of Japanese construction, and four with platform and stake bodies. All of the trucks will be used for the disposal of sewage in Tokyo.

Osaka and Nagoya will soon be on the market for more trucks. The department of communications of Nagoya has purchased a two-ton Garford, fitted with pneumatic tires and a special body.

European light cars continue to lead in local passenger car sales, with every indication of increased popularity. The Fiat 501, which was the outstanding success of this market in 1921, remains in the lead, with Citroen, Bean the Renault 10, and the Ishikawajima Wolseley also doing fairly well. Many local agents are now adding cars of this class to their lines among which may be mentioned the French DFP and Mathis, and the Dnglish Beardmore, American six-cylinder cars are not in demand.

The 10 horse-power Renault is becoming one of the most popular light cars on the Japanese market. Sedans of this model were recently delivered to the Mitsui Bank and the Shibaura Engineering Works.

The Kobe branch of Mitsui Bussan has purchased a Packard Single Six, with Japanese limousine body.

"White" Coaches for Hongkong

THE official run of the six new motor-coaches, with which the Hongkong Hotel Company intend to maintain a regular service between Hongkong and Repulse Bay Hotel, was held on Feb. 11. The first public service will be given during race-week, when the Company hope to use all six coaches in relieving traffic congestion between town and Happy Valley. The limousine coaches are from the White Company, fitted with 40-h.p. engines. The body is enamelled to a shade of Packard blue, and bear on either side of the car the creast of the Hongkong Hotel. The bonnet of the car is black. The roof is double-lined with leather and the sides, from the chassis to the roof, are open. In rainy weather the sides can be closed by means of leather drop curtains fitted with celluloid windows.

The coaches, which are 7-ft. 4-in. wide (over all), seat 12 passengers comfortably. The passengers enter the bus from the back and a gangway runs down the centre. There are five seats taking two passengers each and two single seats at the back. The interior is upholstered with dark leather. Five electric domes are fitted to the roof and bells are fixed alongside each set of seats, so that the passengers can signal to the driver to stop. The coaches have been specially built to suit the colony's roads. The same type of vehicle is very popular in California, for regular long-distance runs.

Osaka's New Roads

THE city of Osaka has announced a most ambitious road building program, which, it is expected, will extend over a period of some seven years, costing in the neighborhood of Y. 140,000,000. The Osaka planning committee has expressed the opinion that the work should be started at once.

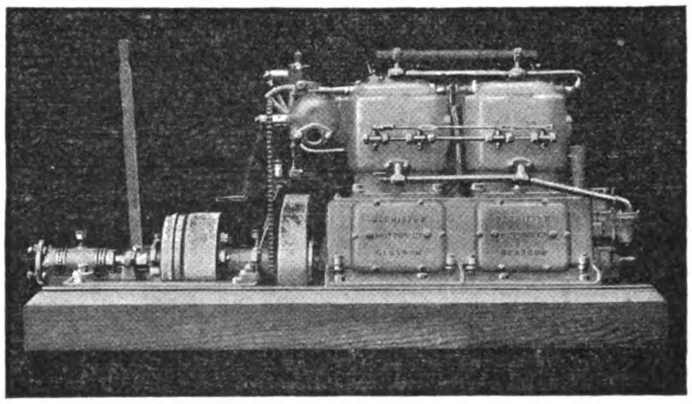
Owing to the fact that more than half of the present fiscal year which is from April, 1921 to March, 1922, has elapsed, it is proposed by the committee to spend only Y.7,015,000 this year. An appropriation providing for this outlay will soon be introduced in the municipal assembly for its approval. This sum will be dispersed as follows: Y.5,317,722 for the expansion and construction works, Y.1,169,180 for the repair of the present roads and Y.528,098 for the readjustment of roads.

How to raise this huge sum, chiefly devoted to road improvement works, is receiving careful consideration of the city planning commission. With a view of carrying out this important work smoothly, the commission was augmented by several additional members who were selected among the prominent business men in the city, Mr. Toyoda Obata, vice-governor of the Osaka prefecture office, and Mr. Hajime Seki, assistant mayor of Osaka, were newly elected as chairman and vice-chairman of the commission respectively.

It is proposed by the committee to float a municipal loan of some Y.75,000,000 to be redeemed in 50 years. It is also hoped by them to obtain some Y.35,000,000 as a subsidy from the central government, the rest of the fund being raised by increasing the municipal taxes for amusement, entertainment, automobiles, rickshaws, bicycles, motorcycles, wagons and various other vehicles. It is also intended to increase tae city tax now

GLENIFFER

KEROSENE & PETROL MARINE MOTORS



FOR ALL TYPES OF BOATS

RANGE OF MODELS—10 TO 90 H.P.

AGENTS:—Douglas and Grant Ltd.—at Madras, Rangoon, Bangkok, Saigon, and Haiphong.

Ritchie and Bisset—at Singapore.

British and Dutch Engineering Co., Ltd.—at Batavia and Soerabaia.

GLENIFFER MOTORS LTD.

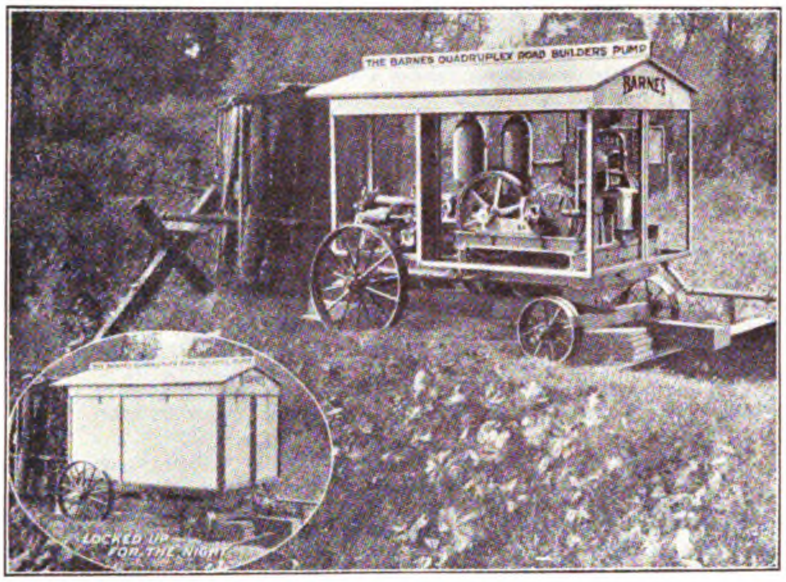
ANNIESLAND, GLASGOW, SCOTLAND.

TELEGRAMS: "GLENGINE, GLASGOW."

being levied upon the local tramway lines. Besides the scheme it is primarily intended to improve and expand the roads, It is also projected by the city planning commission to improve the city's sewer system, the hygienic plants and other civic improvements along the permanent scale for the future of the greatest commercial and industrial metropolitan city in the Japanese empire.

Road Builders Pumps

PUMPING water on road jobs is hard work and a pump must be built right to stand up under this service. A pump must also be built (especially for work in China) which can be locked up at night when it is not in service with a reasonable expectation that the brass fittings and other easily detachable parts will be in their proper place in the morning. To meet the many exactions of a reliable pump for road building purposes, the Barnes Manufacturing Company of Mansfield, Ohio, have completed a



line of special pumps for this purpose. The one shown in the accompanying illustration was employed on a section of the Lincoln Highway near Beaver Falls, Pa., where the most severe pumping conditions were encountered. In reporting on its work, the contractor states "we pushed the water through 21,000-ft. of 2-in. pipe and over a hill 310-ft. high and still got an ample supply for eight sprinkling hose and a 21E paver. We broke the state record for road building with this outfit and the Vuadruplex never failed us. "These pumps are built to be driven with any kind of power, and should prove of value in solving the many road building problems in China where a constant supply of water is required on the job, which may be miles distant from the nearest water supply. The agents of the Barnes pumps in China are the Walworth International Company, with offices at 22 Kiukiang Road, Shanghai.

Body Building in Japan

As a result of the discrimination in the tariff laws of Japan against complete automobiles, there has developed a considerable industry in the manufacture of automobile bodies. Almost every dealer in automobiles in Tokio, where the industry has shown the most rapid development, has facilities for building automobile bodies to order, and it is estimated that from 150 to 250 automobile bodies can be manufactured in Tokio each month.

Many purchasers prefer to have the bodies for their automobiles built in Japan, because it is possible to manufacture a body that will accommodate seven Japanese persons, besides the driver, and mount it upon the chassis of a small car, thus effecting a considerable economy in both cost and upkeep. Such a body could not contain seven average Americans, but the small stature of the average Japanese makes the arrangement possible.

Japan's Motor Imports

ACCORDING to an American consular report, 1,745 automobiles, valued at $2,425,518, and automobile parts to the value of $2,798,141 were imported into Japan during 1920. The total value of automobiles imported in 1919 was $2,757,473 and the value of automobile parts was $2,866,754. The number of automobiles imported in 1919 was 1,579, which indicates that a larger number of medium and low-priced cars were imported in 1920 than in 1919. The value of automobiles and parts imported from the United States was $5,405,818 in 1919 and $5,015,130 in 1920. Italy exported automobiles to Japan amounting in value to $138,041 in 1919 and $9,889 in 1920. No other country had an important share in the Japanese automobile imports in these years. In recent years the value of automobile parts imported into Japan has exceeded the value of the automobiles imported, the excess being relatively much greater in 1920 than it was in 1919. This is explained by the fact that approximately 60 per cent. of the motor vehicles imported into Japan are shipped as unassembled parts of cars, and not as complete automobiles, a practice which is the result of a discrimination in the tariff in favor of automobile parts, together with the saving in freight charges that can be made by the closer packing. As a rule the chassis and other smaller parts are imported without the body, which is built in Japan.

Japanese Unique Selling Plan

SPEAKING of the community idea, consider the Japanese concern that is doing business on a basis of selling an Oakland Six touring car to 200 Japanese. The company was organized in Japan with an initial capital of $150,000. The initial purchase of the company was 55 Oakland Six touring cars, which have been sold to 11,000 Japanese. Strange as it sounds, here is the plan under which the company operates.

Each stockholder in the company pays ten dollars and in return receives a one year's interest in an Oakland Six touring car. The year has been divided into days and hours and a specific time allotted for each stockholder to take a ride. For example, a man is notified that his lime will be from, say every other Thursday from eleven o'clock to three. The plan has been carried out with 200 owners of each car so that four people go out with the driver during the hours allotted to them, so many times each year, at a total cost of $10 each. This arrrangement nets the Japanese concern $2,000 for each car sold and gives the Jap automobile enthusiasts the satisfaction of being a car owner in return for the very modest investment of $10.

The Oakland sixes used in the unique selling plan are standard Oaklend Six touring cars, and were purchased through the Oakland dealer in Seattle, Wash.

While it is difficult to imagine an American accepting a one two-hundreth interest in an Oakland six, the fact remains that 11,000 Japanese have become enthusiastic over the proposition to date. And latest reports from the Far East indicate that the number of "community" Oakland Sixes is constantly increasing.

Motor-Car Market in Japan

WHILE the automobile industry in Japan is depressed at present, its prosperity during the past several years was remarkable, according to the *Japan Times and Mail.* The number of automobiles in Japan at the end of 1913 was 892, the majority belonging to the government offices; the figure increased to approximately 10,000 at the end of 1920.

The following table shows the numbers of cars registered in Tokyo and in Japan as a whole according to official Japanese statistics:

Years.	All Japan.	Tokyo.	Years.	All Japan.	Tokyo.
1913 ...	892	—	1918... ...	4.533	2,079
1914 ...	1,066	—	1919... ...	7,051	3,056
1915 ...	1,244	610	1920... ...	9,998	3,695
1916 ...	1,648	841	1921 (July)...	—	3,781
1917 ...	2,672	1,326			

From these figures alone it would appear as though Japan might be considered an increasingly good market for motor cars; but the facts are rather to the contrary, as the increase in number of cars took place under flourishing economic conditions, while at present circumstances are against the sale of cars. In addition to the chief drawbacks, which are poor roads and weak bridges, the high price for the purchase and maintenance of cars affects the market very unfavorably.

A Japan Made Motor Car

THE first Japan-made motor car is now on the market. It is called the "Midget," and is designed to meet the peculiarities of Japanese roads and local conditions. Its wheel-base is only eighty-four inches and its total weight 850 pounds. It is driven by an air cooled motor of twelve horse-power, and this part of the car is made in Indianapolis.

Motor Cars in South China

THE sale of motor vehicles in Canton has benefited by the street improvements. In 1918 there were only 10 motor cars in the city—all owned by officials—and a few hundred rickshaws. On July 1, 1921, there were 150 motor cars, 25 motor cycles, and approximately 3,000 rickshaws registered with the municipality. The motor cars include 18 autobuses operated by the Canton Tramway Co., pending the building of the street railway system, for which the company has the franchise. The number of motor vehicles imported, according to the Chinese maritime customs service, is as follows: In 1918, none; in 1919, 20 cars and 19 motor cycles; in 1920, 128 cars and 3 motor cycles; in the first six months of 1921, 18 cars and 3 motor cycles.

All motor cars in Canton, so far as can be ascertained, are of American manufacture; unfortunately, most of them are second-hand. Only one firm in Canton which has the agency for American cars, and this firm has no service station. None of the so-called "garages," of which there are now 32, are equipped to supply spare parts or to do repair work except of the very simplest nature.

Since January 1, 1920, the city of Canton has made considerable progress in street building. Prior to that date Canton had only six miles of streets over which a motor car might pass. None of these ran through the city proper, but merely along the river front and eastern suburbs. The major part of the city, where nearly 1,000,000 people live, had no streets suitable for wheeled traffic.

By July 1, 1921, the city had completed, except for the final concrete surfacing, nine additional miles of modern streets, varying in width from 80 to 150-ft., with sewerage laid down in the entire length and running through the heart of the city. In addition, it had 7½ miles under construction which are expected to be completed by the end of the year. The streets are built of a foundation of crushed brick and stone, with a surfacing of concrete, and are well graded.

To accomplish this program the municipality had to tear down 5,000 houses, 15 city gates, and 6½ miles of old city wall, and had to fill in 1,300-ft. of canal. Some other new streets have been built on the site of the old city wall, which was torn down for the purpose, and along the route of old canals.

Trucks in Hongkong

A DECIDED improvement in the market for American motor trucks became evident in Hongkong in the early part of November. Within a few weeks orders were placed in the United States for a total of 11trucks. Previously the number of commercial vehicles in the colony had never exceeded seven.

This increased use of trucks is due to better roads. The first motor road to the Peak is now in course of building, at considerable labor and expense. It has already been completed to the upper level and will soon be carried along the crest. Another road is being built across the hills to the other side of the island. These roads not only will open up many new building sites but will permit truck delivery of freight to portions of the island that are now inacessible except by coolie carriers. There are about 470 passenger cars in the colony, the great majority of them American.

Marine Motors in Canton

THERE is a good potential market for marine motors in the Canton consular district, according to Vice-Consul Ernest B. Price. To illustrate the situation, a brief preliminary survey of the transportation conditions in South China should be given. If a circle were drawn with a radius of 25 miles, with its centre about 25 miles down the Chu Kong, or Pearl River, from Canton, it would comprise a land and water area of about 1,900 square miles and a population of not less than 10,000,000, or approximately 5,200 persons per square mile. This region, known in South China as the Canton Delta, is not only one of the most densely populated areas in the world but comprises, at the same time, one of the finest networks of natural waterways to be found anywhere. The circumference of the circle so drawn would include or touch at least ten cities, each with a population of 75,000 or over. Within this area is grown nearly half the quantity of rice needed to supply the 30,000,000 people of the province of Kwantung. This populous and prosperous region has less than 200 miles of railway.

As the purpose of this report is primarily to indicate a possible market in Canton for marine motors, no attention will be paid to the tonnage of ocean-going vessels entering and clearing at Canton. Of the non-ocean-going vessels, the number entered and cleared at Canton in 1920 under inland steam navigation rules (vessels registered for Chinese inland waters navigation only, and including both steam and motor driven craft), according to the Chinese maritime customs for 1920, totaled 54,235, with a tonnage totaling 836,140. During the same period 6,119 non-ocean-going vessels of 2,383,210 tonnage entered and cleared at Canton under general regulations (vessels capable of plying to Hongkong and Macao, as well as inland ports). These vessels included 3,534 river steamers (2,264,594 tons), 473 lighters (77,755 tons), and 2,112 launches (6,119 tons.) In addition to the above the customs records show that 8,293 native cargo-boats, not power driven, entered and cleared at the port in 1920. Of a total of 1,719 vessels registered in all China under inland steam navigation rules in 1920 (in which class are included motor-driven craft), 542 were registered in Canton. Of this number 493 were steam and 49 motor driven. Of the 49 registered motor-driven vessels 16 were registered as combined cargo and passenger carriers and 33 as pleasure boats. As the registration of pleasure boats is not compulsory, however, it is believed that there were at least that many unregistered.

Of the 542 registered vessels plying the inland waterways of the Canton Delta the vast majority are launches used for towing passenger and cargo junks, by which form of conveyance the great bulk of the passenger and freight traffic in the Delta is carried on. It is in the supplying of American marine motors (particularly the type operating on fuel oil) for this type of vessel that it is believed a market exists.

While there is, and probably will continue to be, some demand for gasoline and kerosene marine engines in pleature craft, the high cost of both gasoline and kerosene acts as a powerful restriction. But in view of the lower operating and stand-by expenses of fuel-oil engines as compared with steam engines it is felt that there is an excellent potential market for fuel-oil engines to be used in tow launches in the Canton Delta, and possibly for other applications.

FURTHER BIG REDUCTIONS

DENNIS

COMMERCIAL MOTORS

Practically back to Pre-War Prices

Type	To-day's Price	Price Jan., 1921	Reduction
2-2½-ton Standard Lorry Chassis...	£730	£ 997	£267
2-2½-ton Long Char-a-bane Chassis	£750	£1,007	£257
3½-4-ton Lorry Chassis	£865	£1,195	£330
3½-4-ton Char-a-bane Chassis ...	£880	£1,190	£310
4-ton Long Wheelbase Omnibus Chassis	£950	£1,200	£350
5-6-ton Lorry Chassis	£960	£1,320	£370

The prices given above are F.O.B. Guildford, England

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AUTOMOTIVE NOTES.—New Roads, etc., in China

Two Automobile Companies, Shantung.—Two automobile transportation companies are being organized in Shantung to run autobus service on the Yucheng-Tungping automobile road lately built by the American red cross on behalf of Chinese, more than 200 *li* in length, and on the Tsining-Lohsien automobile road respectively. The Yucheng-Tungping line is to be operated by Mr. Pao Lien-sui, offering a road hire of $15.10 per *li* to the road administration of Shantung, and the Tsining-Lohsien line by Mr. Chu Hai-shan at a rent of $16 per *li*. Automobile roads are also being planned to be built from Cheng-teh to Tsinan and from Kaifeng to Tsining.

Shanghai-Minghong-Nanwai-choling Auto Bus Company.—Along the line of Shanghai-Minghong-Nanwai Choling automobile road, there will be erected eleven bridges, construction work on which has been started. Land along the line for construction of the road is being purchased by the company. An order for several automobiles has been placed with Lee-woo & Company, a German firm, and two steam road rollers will be also purchased from the same firm, each costing about $3,000.

Provincial Roads, Kwangsi.—The regulations governing road construction in Kwangsi provide for two important provincial roads from Yungning to Wuchow viâ Ping-yang, Kwai-hsien, Kwai-ping, Ping-nan and Tunhsien and from Kwei-ling to Mong-kiang viâ Yang-soo, Lih-poo and Mongshan. Mr. Mar Chuen-wu, civil governor of Kwangsi, has ordered Mr. Soo Chien, chief of public works department, to co-operate with the district magistrates and complete the former road in six months. Mr. Soo Woo-yar, chief of road construction department, is to have the latter, highway completed within the same period.

Anhwei-Chekiang Automobile Road.—Merchants of Anhwei and Chekiang have promoted an automobile transportation enterprise between Anhwei and Chekiang by building a modern road from Yu-hang, Chekiang, to Hweichow, Anhwei, with a capital of $1,600,000 to be partly raised by the promoters and partly by public subscription at $50 each share.

New Road, Harbin.—The Harbin improvement work bureau, recently established to develop the port of Chu-er-ho, will construct a modern road at Fu-chiar-dien. The expenses involved will be drawn from land tax.

Auto Bus Service, Nantungchow.—An automobile transportation service has been inaugurated at King-sha-sze, near Nantungchow.

Motor Cars for Harbin Post Office.—The Chinese post office at Harbin is negotiating with the Oriental Automobile Transportation Company, a Russian organization at Dao-lee, Harbin, for hiring their motor cars to deliver mail.

Automobile Road Proposed, Kwangsi.—With approval of Mr. Mar Chung-wu, civil governor of Kwangsi, the Chinese chamber of commerce at Pah-pu, in Wuhsien, Kwangsi, in co-operation with the Wuchow chamber, is planning to build an automobile road from Pah-pu to Wuchow, a distance of over 300 *li*, which is extimated to cost about $100,000.

Changshan-Yushan Automobile Road.—The particulars of the automobile road from Chang-shan, Chekiang, to Yu-shan, Kiangsi. Proposed by Mr. Chen Shu-tang, are as follows: *Length*, eighty *li*; *Width*, twenty feet: *Road Bed*: a distance of 46 *li* calls for a fill of two to three feet; 14 *li*, a fill of 5-ft., and the remaining twenty *li* excavated to an average depth of four feet. The foundation will be covered by a layer of stone, on which six inches of gravel and two inches of surface coverings will be added. *Curves* to be limited to a radius of 50-ft. *Slope*. The road will have a slope of 45 degrees at both, sides which, however, may be altered if circumstances render if necessary when work is carried out. The slopes will be built of stones. *Ditches*. On each side of the road, a ditch of 10-ft. wide will be dug. *Bridges*. A reinforced concrete bridge of 210-ft. long with three arches will be constructed over King-sha-chee at Yu-shan. Besides, six 15-ft. reinforced concrete bridges and twenty 6-ft. stone bridges will be built on the whole line. *Sluices*. Many sluices with a limiting height of three feet will be built. *Stations*. Two stations and two sub-stations will be built and at Chung-chien-ling-der an automobile repairing works will be established. *Garages, etc.* Four garages containing twelve rooms, two warehouses containing twenty rooms and two gasolin storages containing four rooms will be built *Coolies' Rooms*. Forty coolies' rooms will be built at a distance of two *li* apart. *Passenger Cars*. Four passenger cars will be purchased. The vehicles are to have a gasoline efficiency of 40 *li* to the gallon; 30 h.p.; speed, 60 *li* per hour; weight, 2½ tons. *Freight Cars*. Fourteen freight cars will be purchased. They are to have a gasoline efficiency of 40 *li* to the gallon; 30 h.p.; speed, 40 *li* per hour; weight 2½ tons. *Road Rollers*. One 8-ton steam road roller and two 1-ton stone-rollers will be purchased. *Other Equipment*. Spades, shovels, carts, watercasks, weeps, etc., will be purchased.

Auto Bus Company, Shansi.—The Tsing Pei or Northern Shansi Automobile Transportation Company is being organized at Taiyuanfu with a capital of $20,000.

Automobile Transportation Company, Hankow.—Mr. Wang Chiliang is promoting an automobile transportation company at Hankow to operate a service on the outskirts of the city.

Provincial Roads, Chekiang.—Construction of the main Chekiang provincial highway running through Wen-chow, Dan-chow, Hsiao-shun, etc., has been started. Another important road in the province has been surveyed by Mr. Chen Shu-tang. The proposed road will start from Hangchow, and end at Yu-shan, Kiangsi, a distance of 592 *li*, and will call for an expenditure of about $4,000,000. Work on the most important section from Chang-shan to Yu-shan will be started at an estimated cost of $2,000,000.

Road Construction, Canton.—A modern road 14,000-ft. in length and 100-ft. wide, will be constructed between Canton and Tsen-poo by the Canton road construction department at an estimated cost of $150,000.

Another modern road starting from Taikeng Road is also being built at a cost of over $100,000.

Service from Yuen-Chen to Tung-Chong.—Mr. Pao of Tang-hsien, Shantung, has raised a capital of $100,000 for organizing an automobile transportation company to run a service with ten vehicles from Yue-chen to Tung-chong, a section on the newly-built American red cross road in Shantung.

New Roads, Swatow.—A plan for widening the principal streets of Swatow and building modern roads has been drawn up, and work on one road, to be about 40-ft. wide, has been started. The road-building scheme, in all probability, will make slow progress owing to shortage of funds. It is proposed to start work on a second road early in 1922.

Auto Bus Service Chihli.—The automobile transportation service from Kao-yang-hsien to Paotingfu, which was interrupted sometime ago has been resumed by the Yah Tung Automobile Transportation Company at Paotingfu, while the traffic on the whole line from Tientsin to Paotingfu will be inaugurated before long.

Tehchow-Nankung Auto Bus Service.—Local merchants are preparing to operate an autobus service on the road from Tehchow, Shantung, to Nankung, Chihli, built by the American red cross last year.

Chekiang-Kiangsi Provincial Road.—Mr. Chen Shu-tang, ex-director of Haining embankment work bureau, a road expert, has proposed the construction of a provincial road from Hangchow, Chekiang, to Yu-shan, Kiangsi, viâ Yue-hong, Fu-yang, Sing-tun, Tung-lu, Kien-teh, Lan-chee, Lung-yue, Ju-chow and Chang-shan, a distance of 592 *li*.

In the prospectus, Mr. Chen divides the line into eight sections, the one from Cheng-shan to Yu-shan to be built first. According to his estimate, the work will take eight years to complete, and calls for an expenditure of $4,000,000. A company will be organized to operate an autobus service on the road. When completed, the road will be owned and controlled by the company for thirty years, and at the expiration of the period, the property will be handed over to government. The proposals have been approved by the provincial authorities of Chekiang.

A New Auto Bus Service.—The Yah Tung Tientsin-Paoting Autobus Service Company, Tientsin, has been recently registered with the ministry of communication.

Chekiang-Anhwei Auto Bus Service.—The Chekiang-Anhwei Autobus service Company, Ltd., will be established with a capital of $1,600,000 by Mr. Wu Di-ching, of Anhwei, in co-operation with several Chekiang merchants, to build an automobile road between Hangchow and Tun-chee, Anhwei, survey of the route is being carried on, and the company will have temporary office in Shanghai.

Auto Bus Service Company Extending Line.—The Yen Foo Chien Automobile Transportation Company at Foochow is planning to extend the motor road from the south gate of the city to Hung-shan-jao, and survey of the prolonged line has been completed. The work is expected to start in April.

Chefoo-Wenhsien Motor Road.—While the ministry of communications is inviting reliable merchants to operate automobile service on the newly-built Chefoo-Wenhsien highway on franchise, the construction of stations by the ministry on behalf of motor service companies will be started. The Lungkow station will be established either at Ju-ching or 7 *li* away from Ju-ching. Mr. Tsai Chen-mow has been appointed to locate sites of other stations from Foo-chan to Boongwang.

Canton-Kowloon Auto Bus Service.—Autobus service was inaugurated on the Canton-Kowloon road on February 6, 1922.

Soochow-Kashing-Huchow Automobile Road.—An automobile road between Soochow, Kashing and Huchow and operate autobus service thereon is proceeding with remarkable activity. Many wealthy merchants of the places concerned have joined in investing in the enterprise. The company is to be capitalized at $5,000,000 and the roads built and operated will be (1) from Soochow to Pingfong, thence the road will diverge westernly to Huchow passing by Nanhsing and south-easterly to Kashing viâ Shen-shih, (2) from Soochow to Foo-shan-tseng viâ Changzo, (3) from Soochow to Taichong viâ Quanshan, connecting with the Shanghai-Taichong automobile road built by the Shanghai Taichong Autobus Service Company, Ltd., Shanghai, and (4) from Kashing to Choupu viâ Pinghu.

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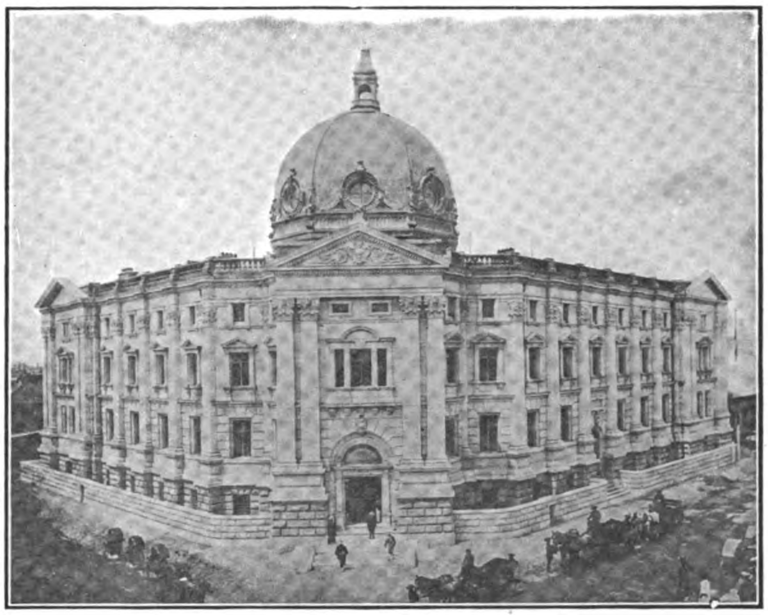

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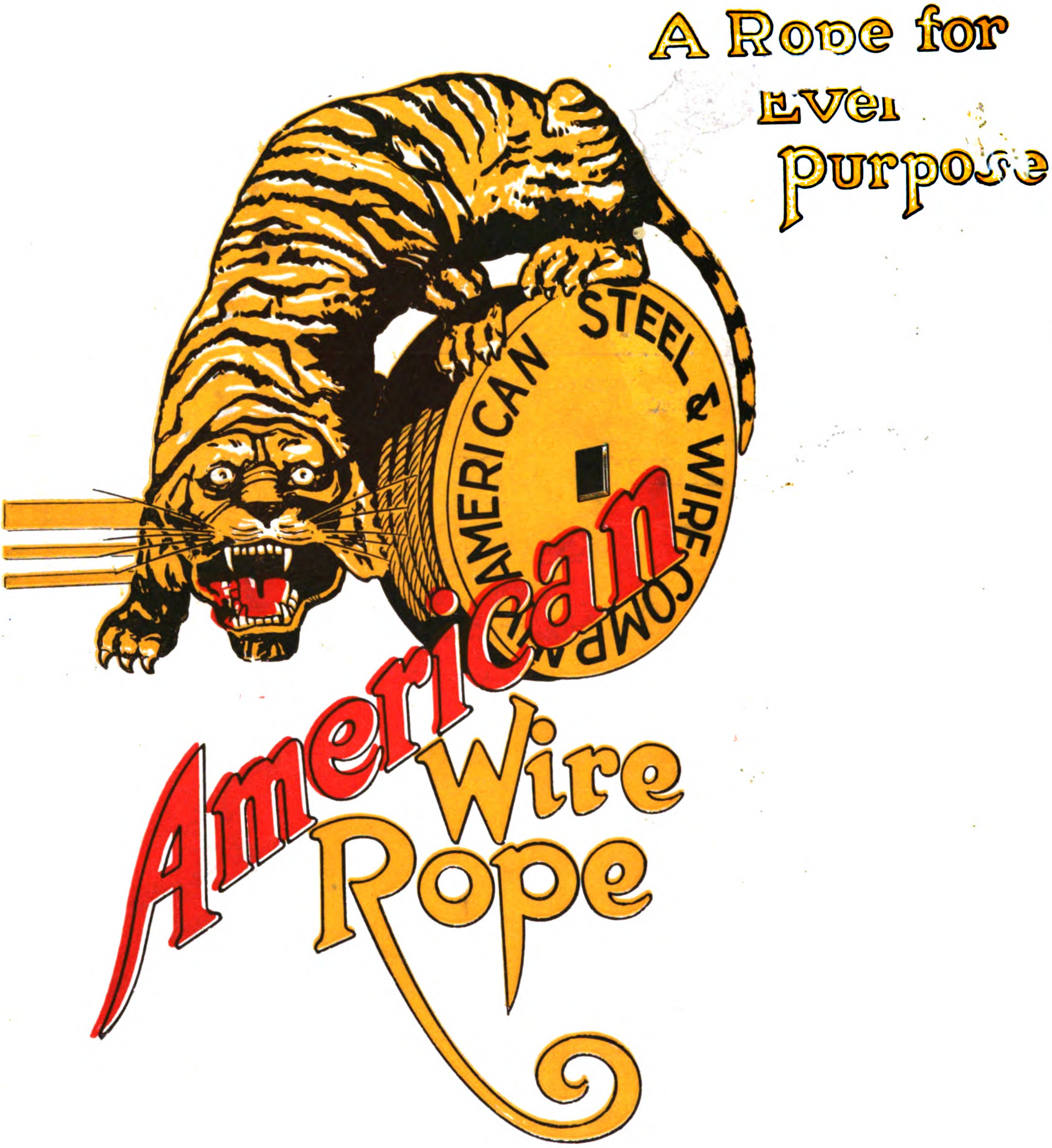

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JAPANESE ELECTRIC RAILWAYS

UNIVERSITY OF HONGKONG

SUPERSTRUCTURE OF N.E.I. RAILWAYS

RUSSIAN TIMBER TRADE

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Vol. XVIII APRIL, 1922 No. 4

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3½-4-ton Char-a-bane Chassis ...	**£880**	£1,190	***£310***
4-ton Long Wheelbase Omnibus Chassis	**£950**	£1,200	***£350***
5-6-ton Lorry Chassis	**£960**	£1,320	***£370***

The prices given above are F.O.B. Guildford, England

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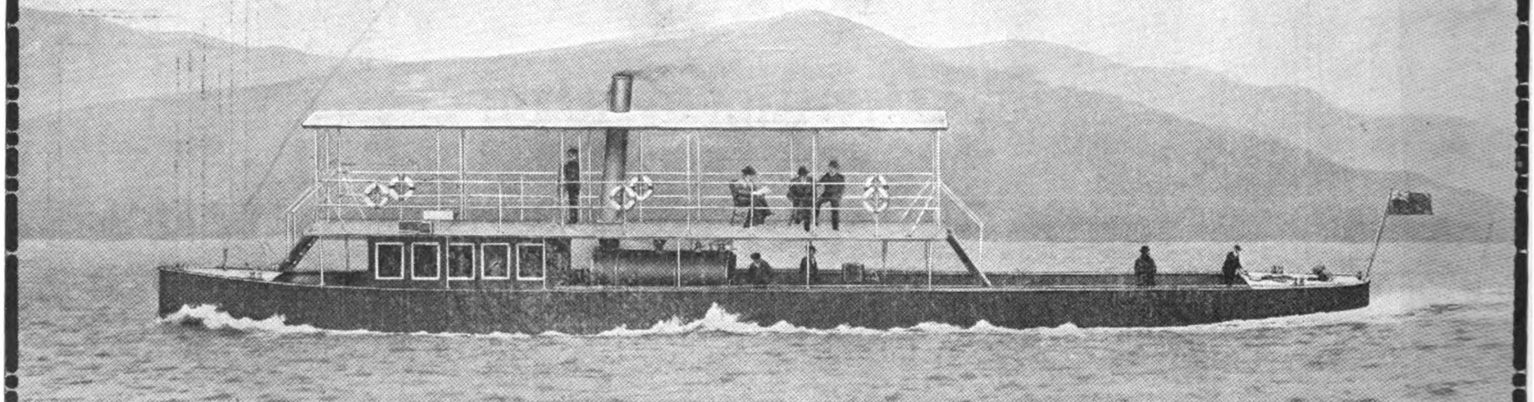

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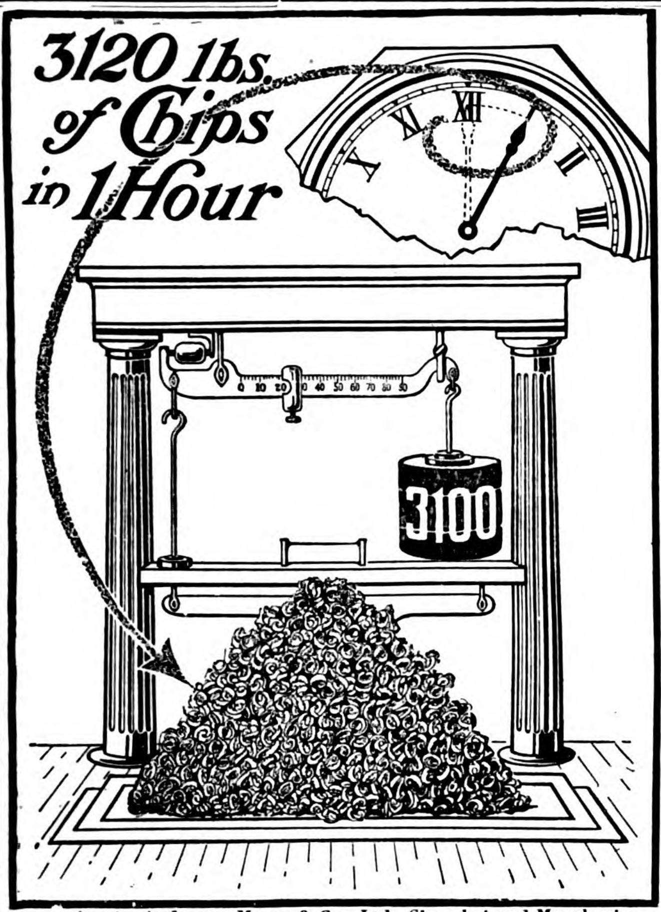

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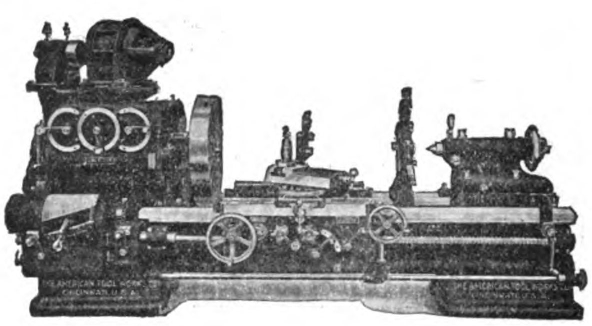

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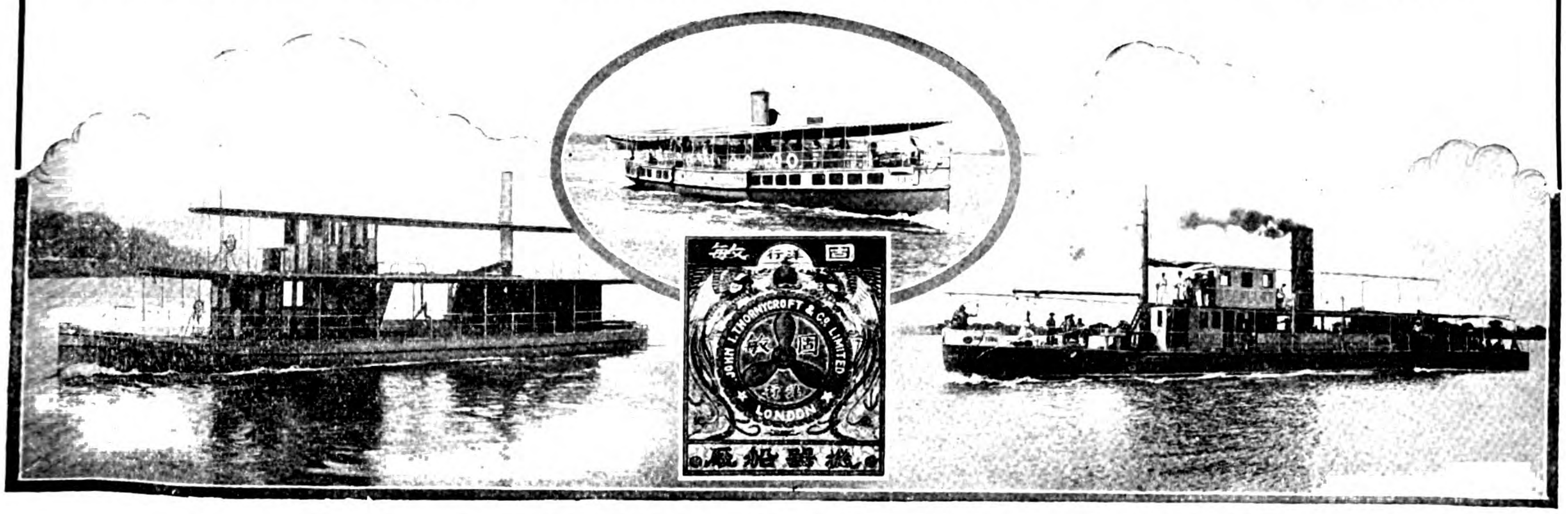

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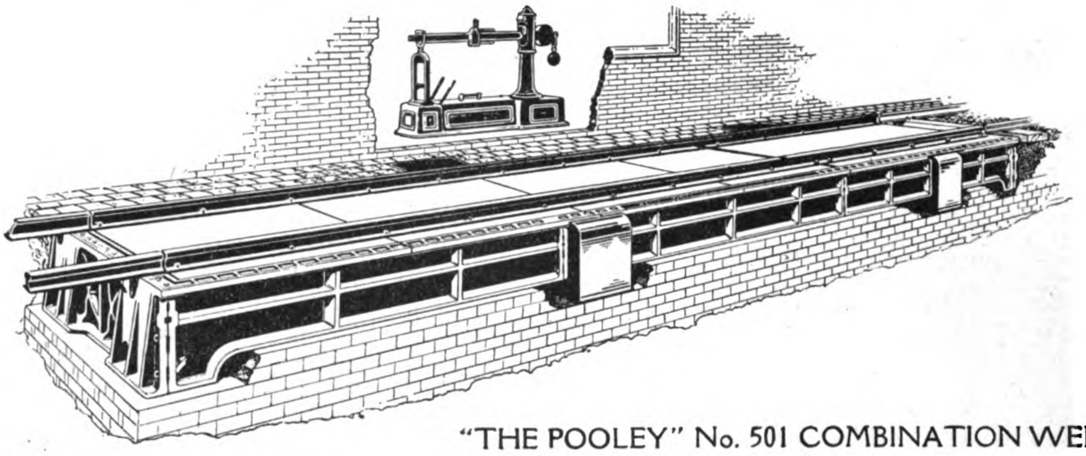

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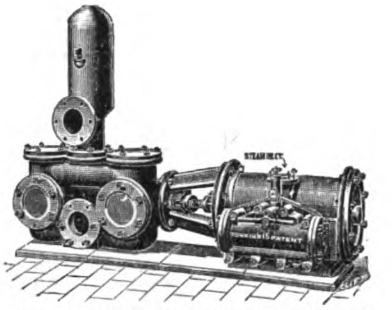

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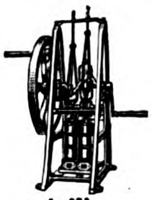
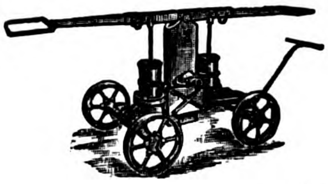


Fig. 228.

Fig. 160.



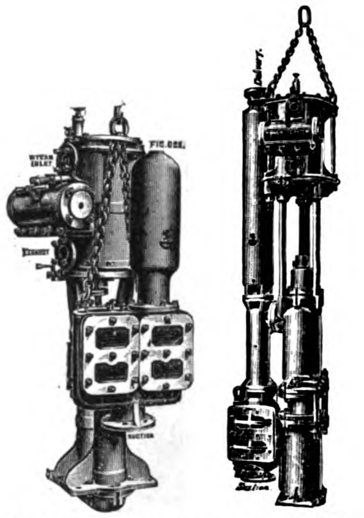


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Fig. 191.

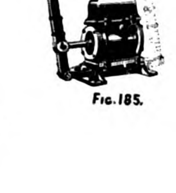
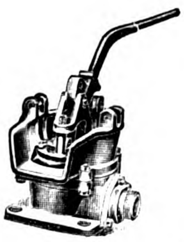


Fig. 185.



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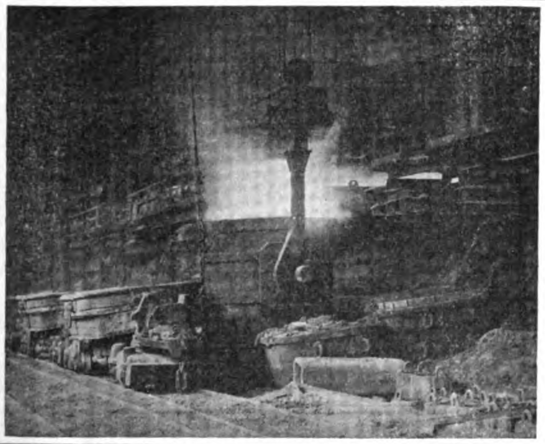

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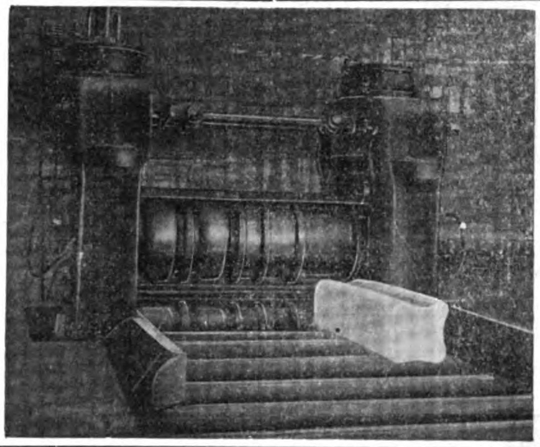

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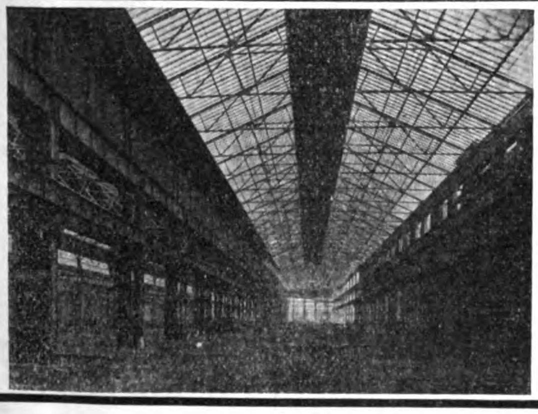

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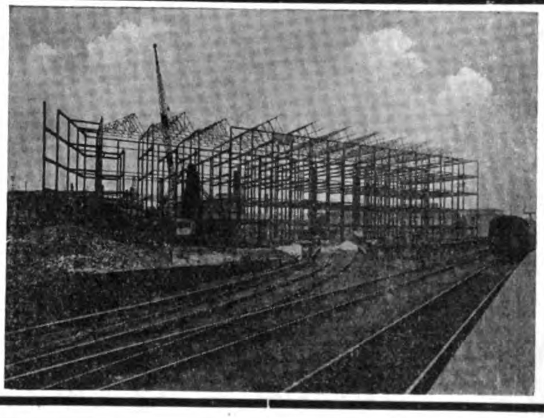

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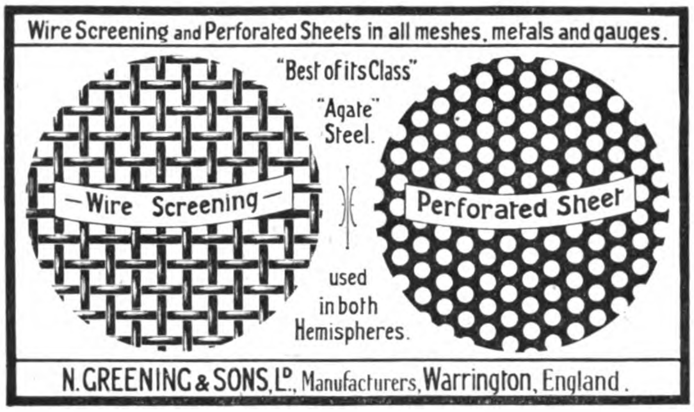

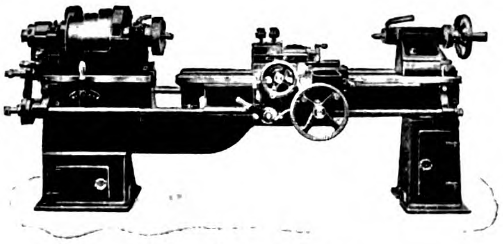

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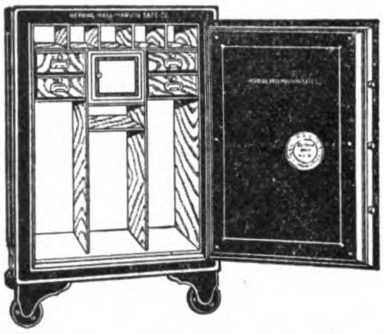

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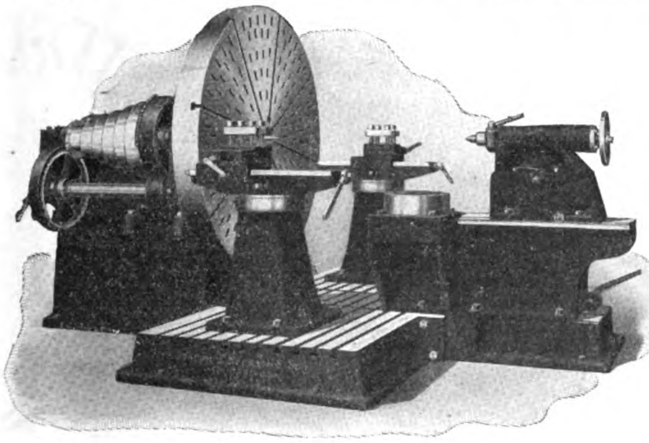
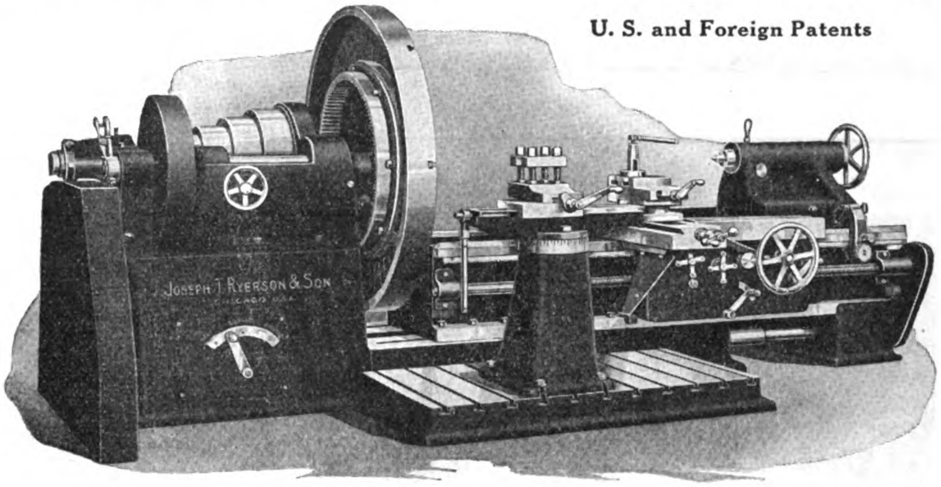
U. S. and Foreign Patents



The Ryerson-CMC Standard Face Plate Lathe is specially designed for turning turbine and generator housings, large pulleys, flywheels, etc. This machine has two tool rests so that two tools may be used, one at the front and one at the back of the machine. Special driving dogs may be attached to the face plate for holding the work to be turned. We build this machine in three sizes, to swing over bed, maximum of 73″, 85″ and 98″.

Ryerson-CMC Extension Bed and Break Lathe

U. S. and Foreign Patents



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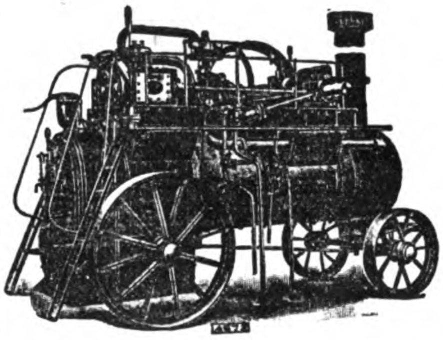

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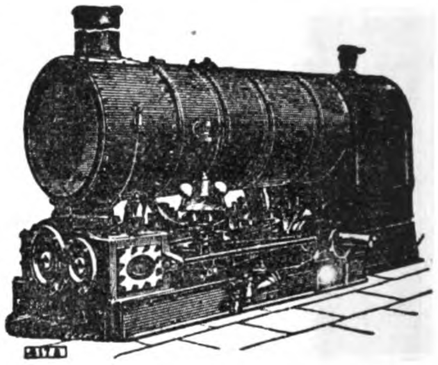

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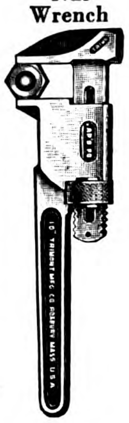

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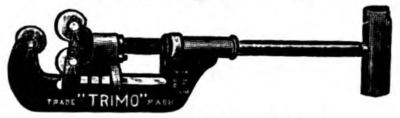

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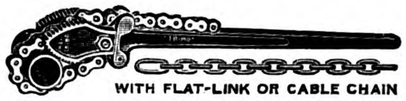

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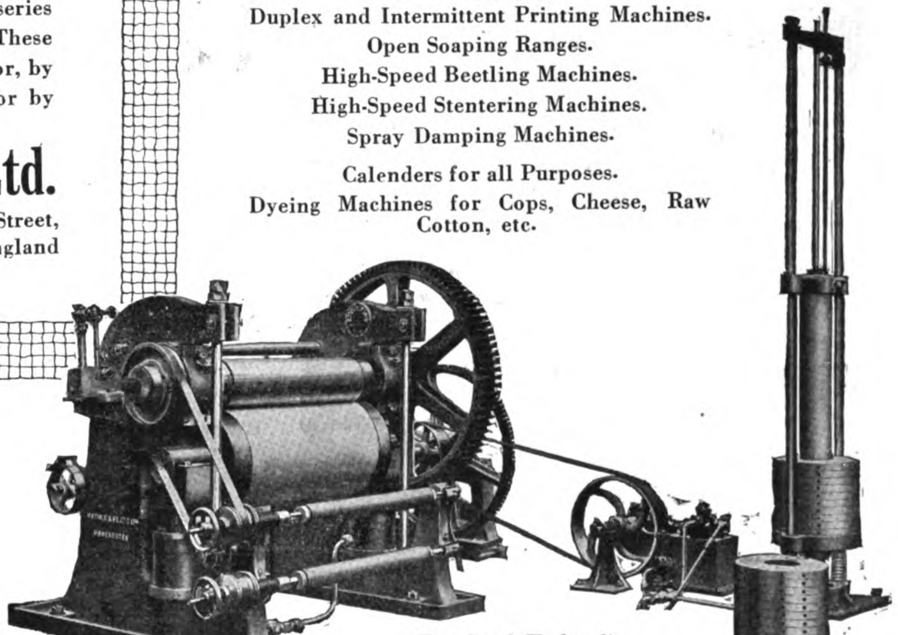

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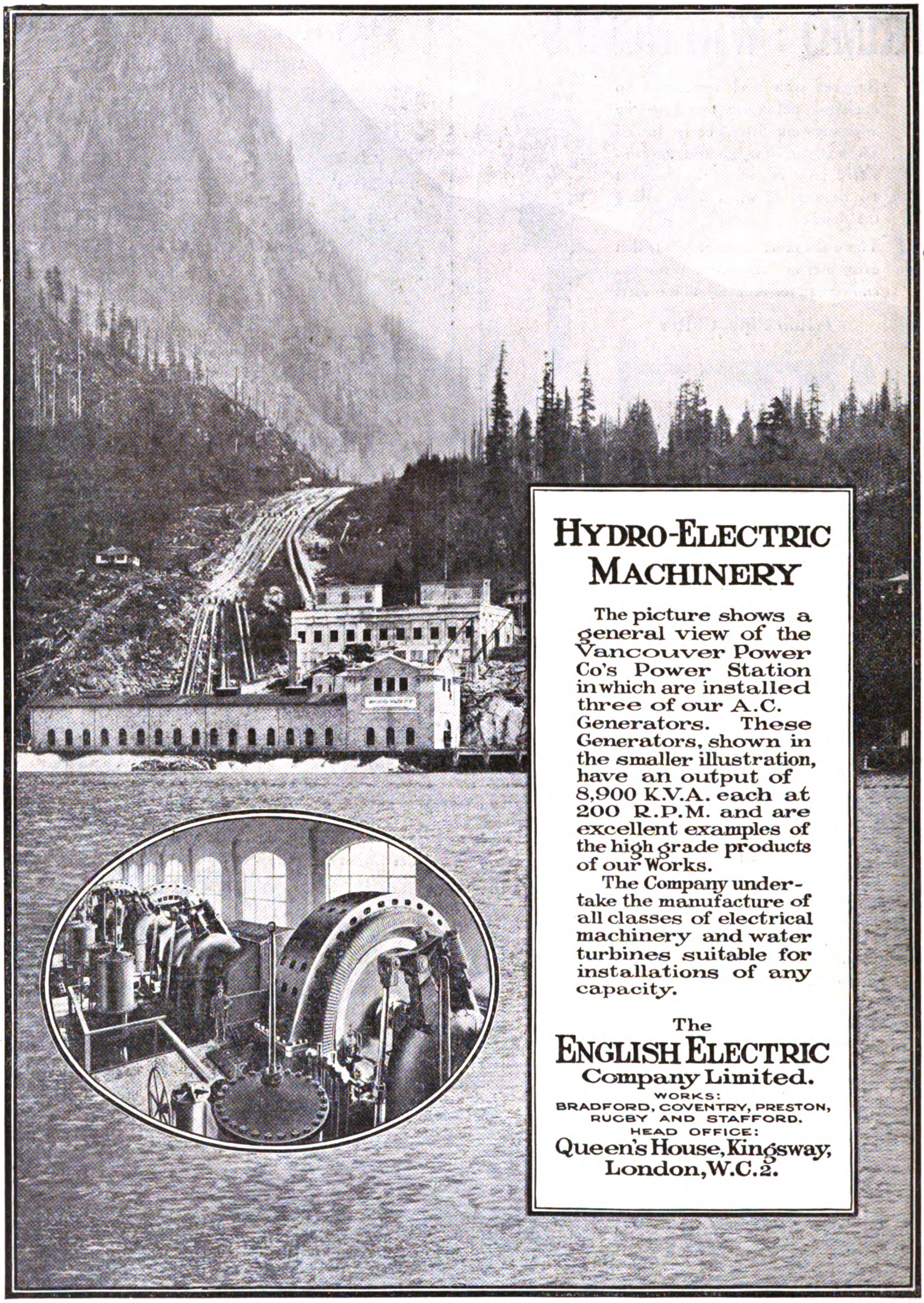

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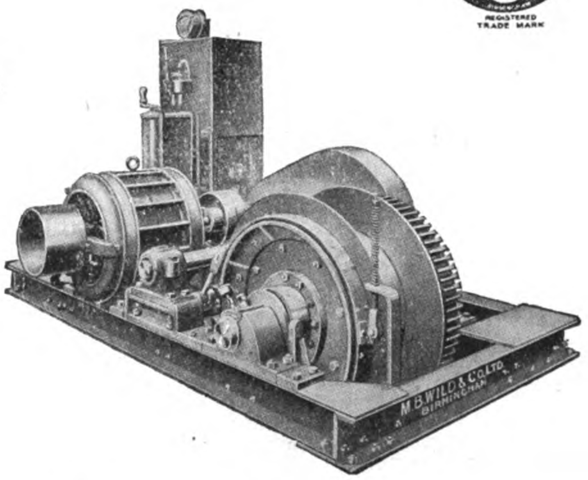

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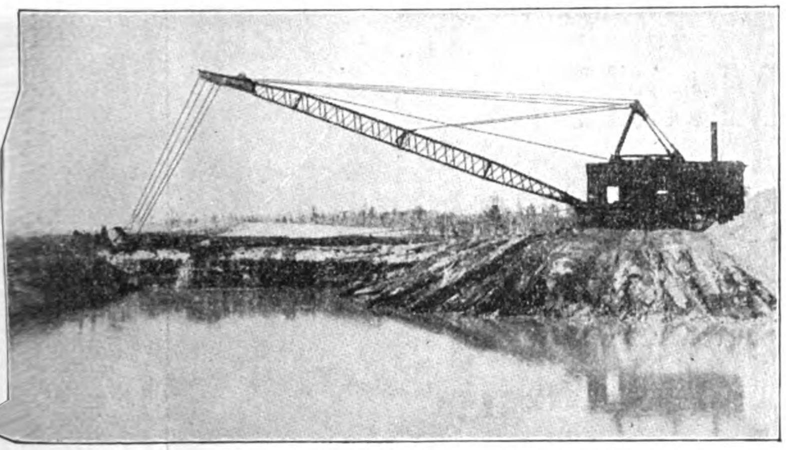

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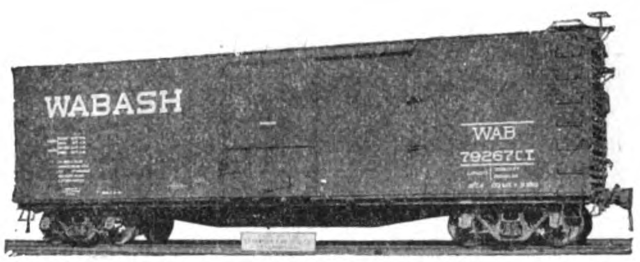

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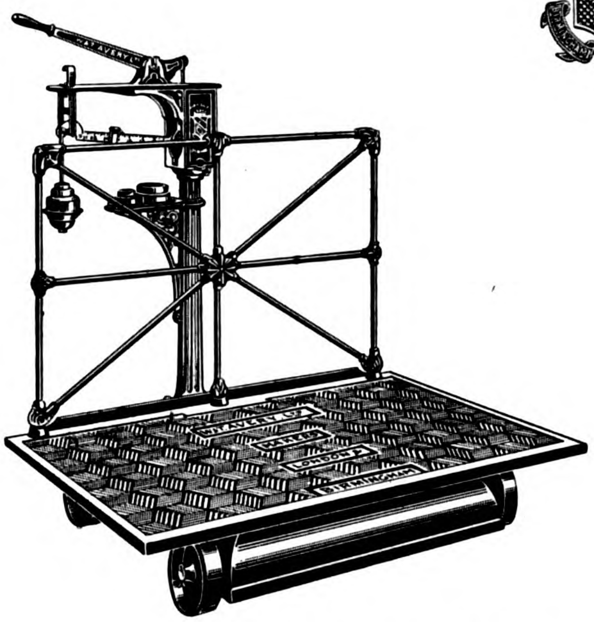

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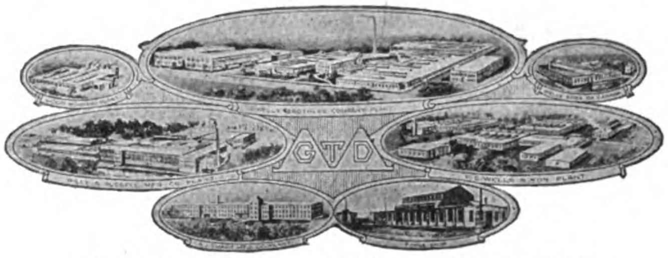

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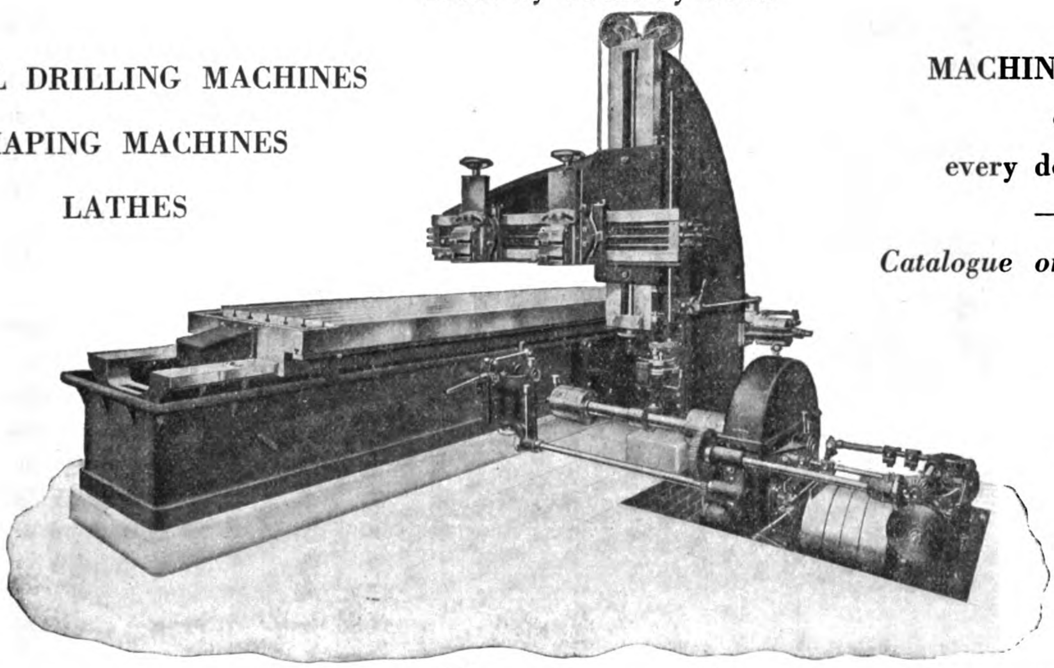

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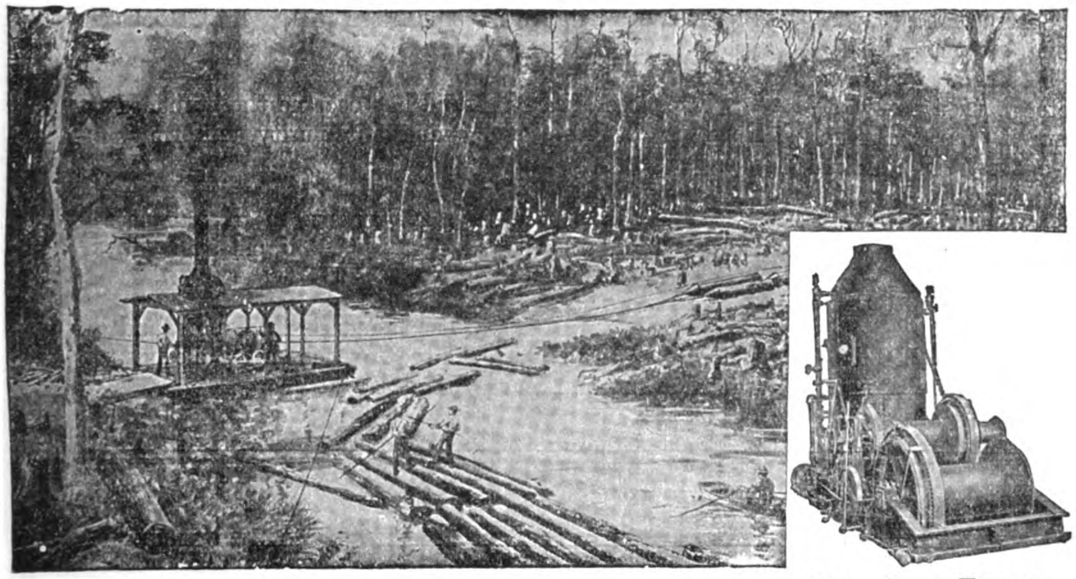

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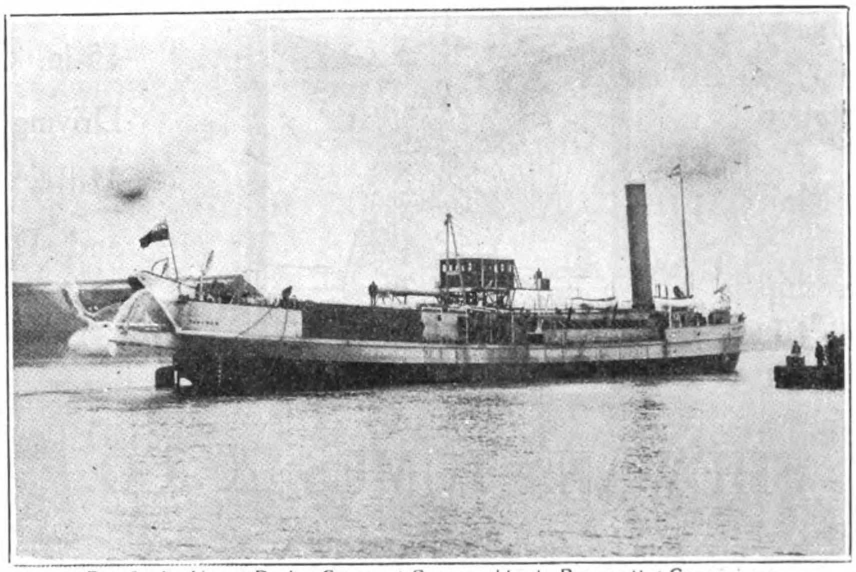

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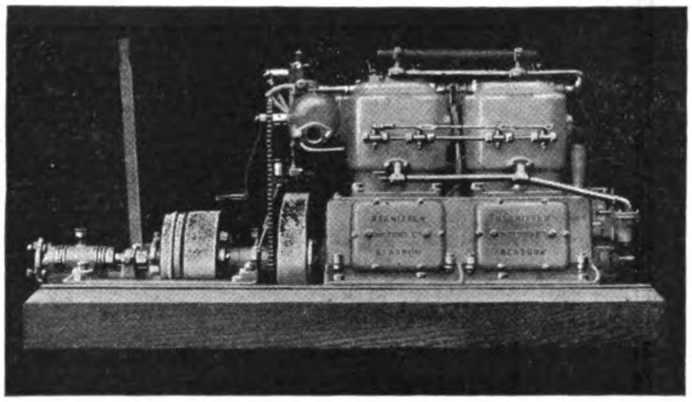

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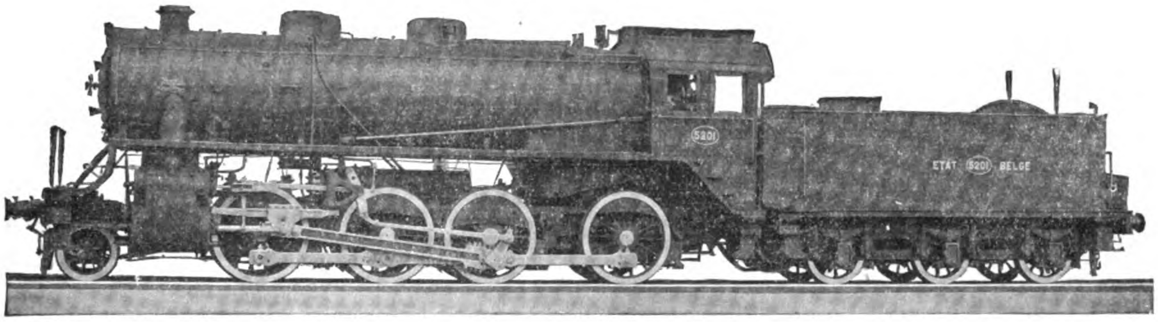

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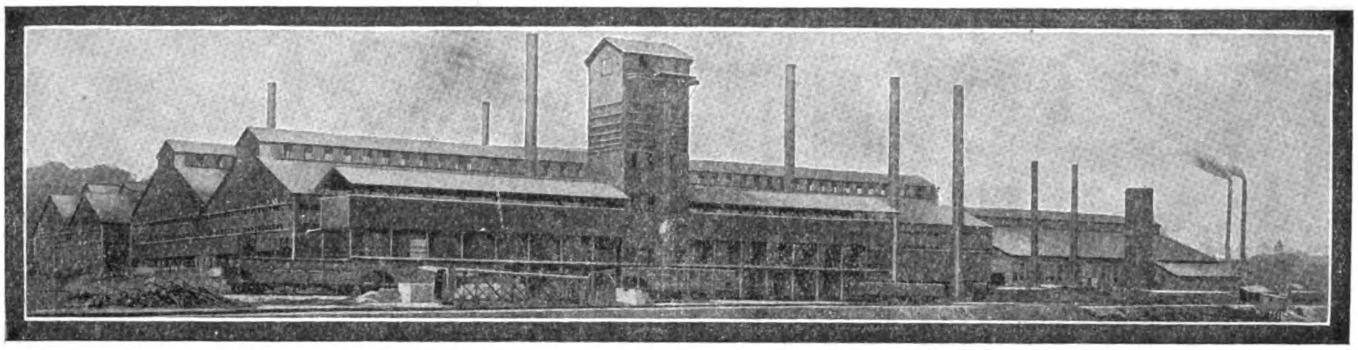

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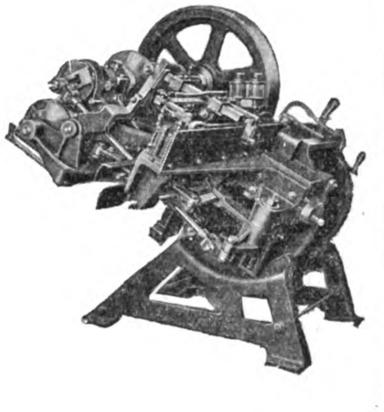

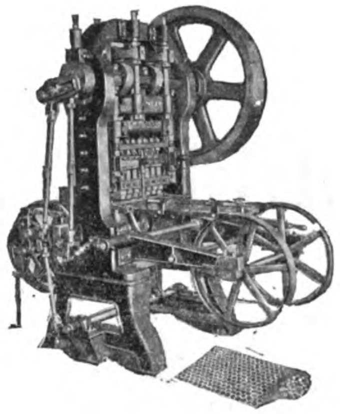

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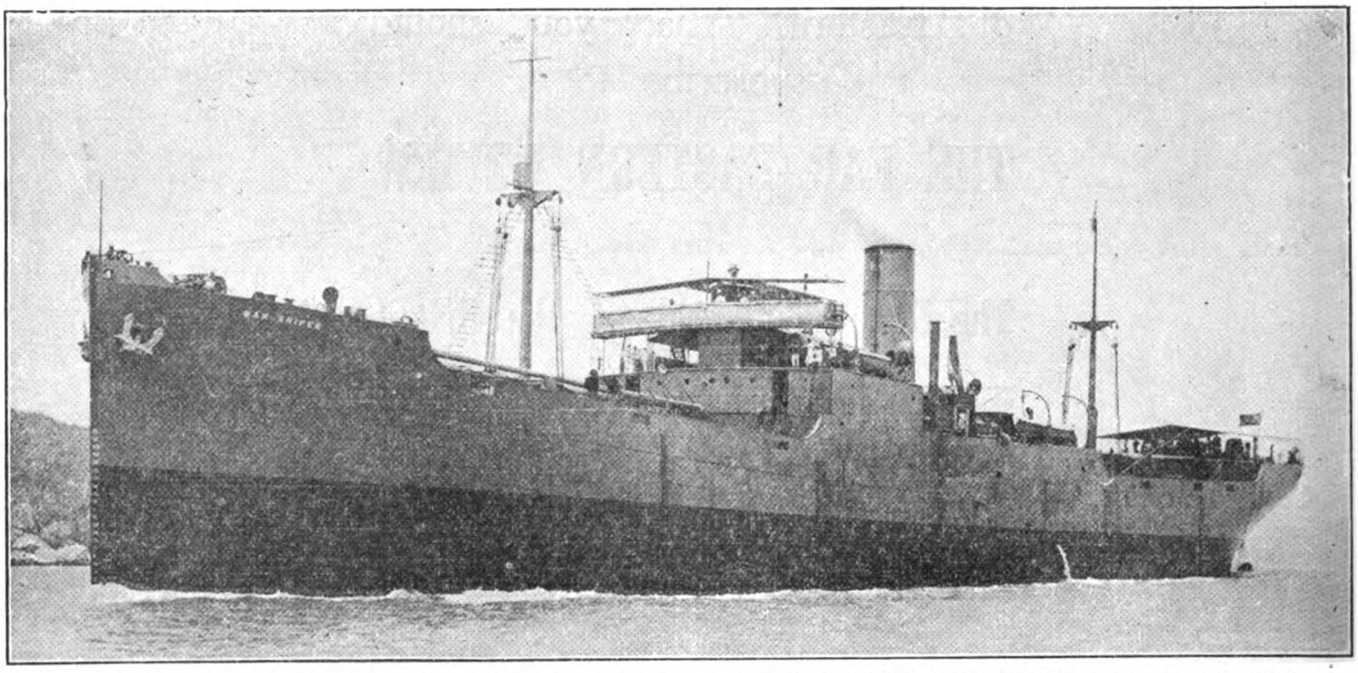

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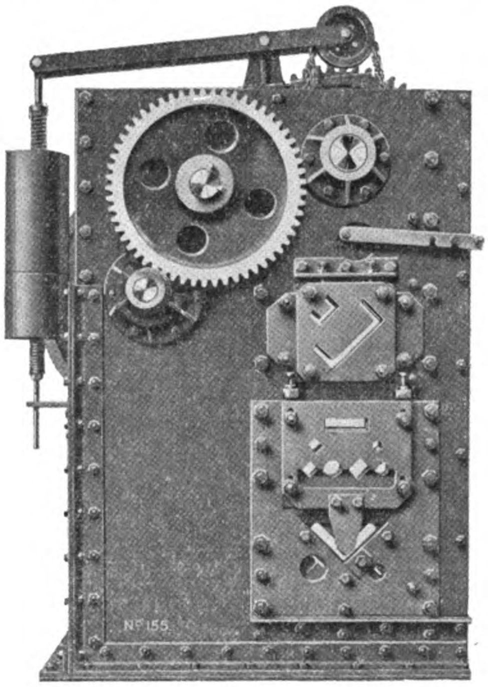

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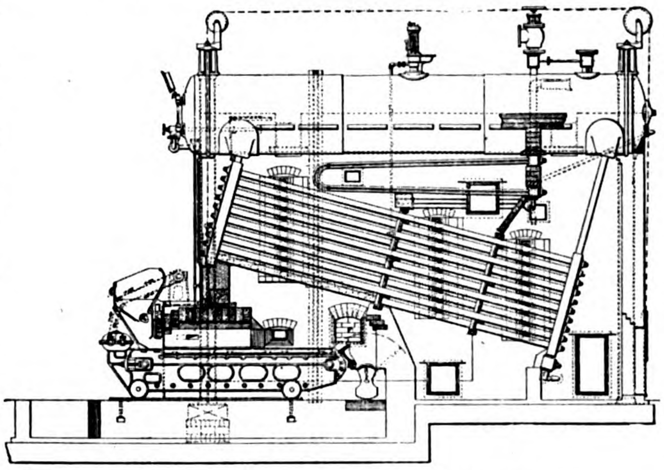

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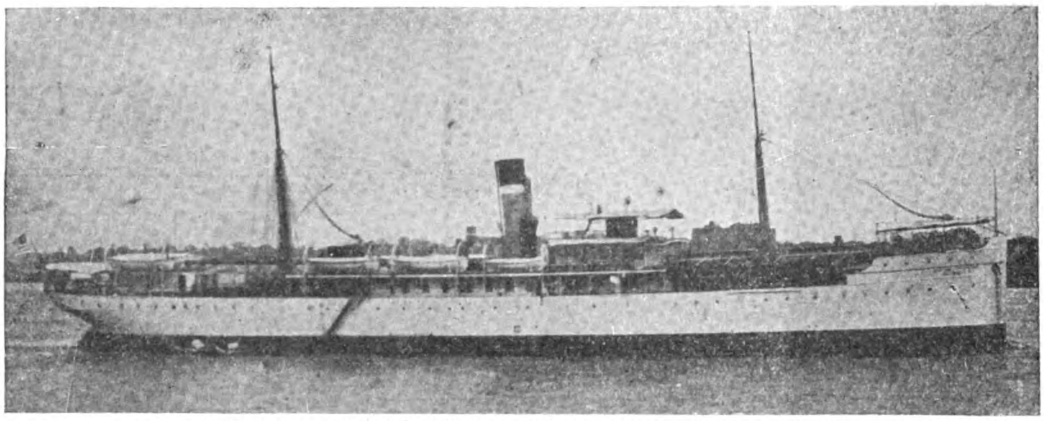

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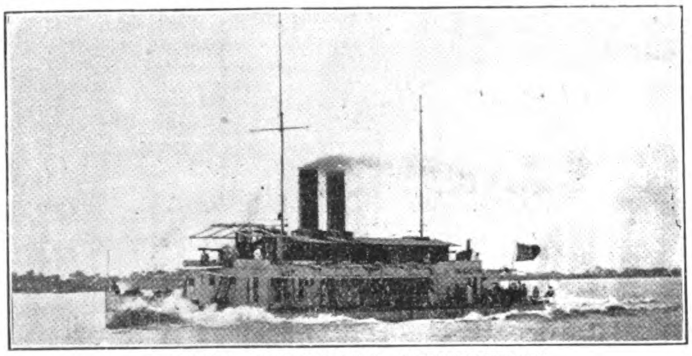

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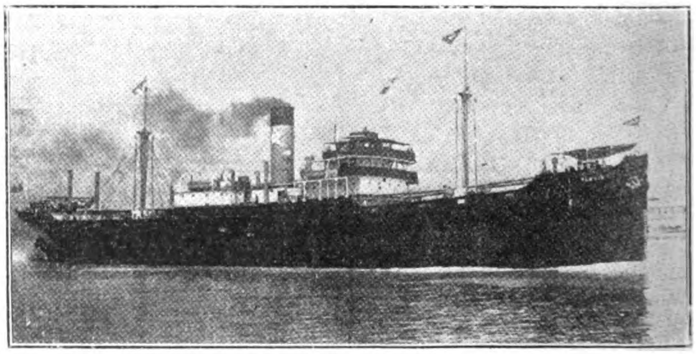

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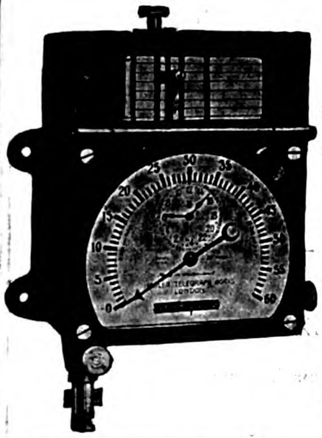

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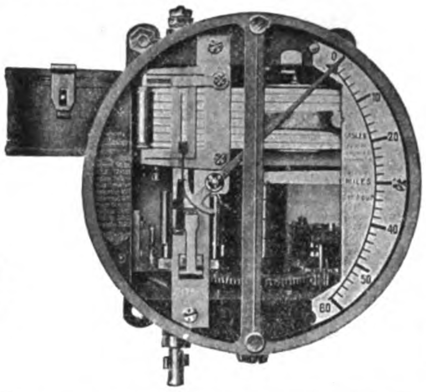

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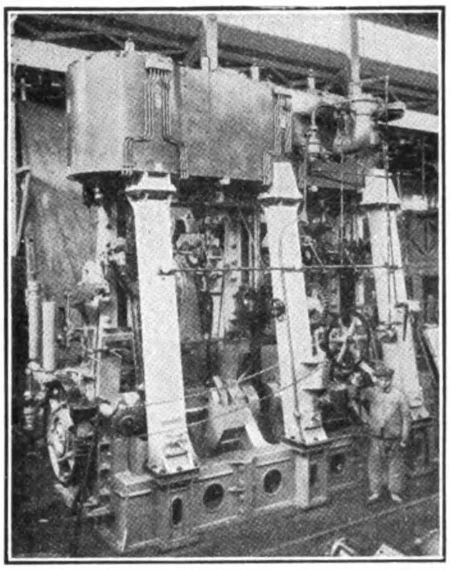

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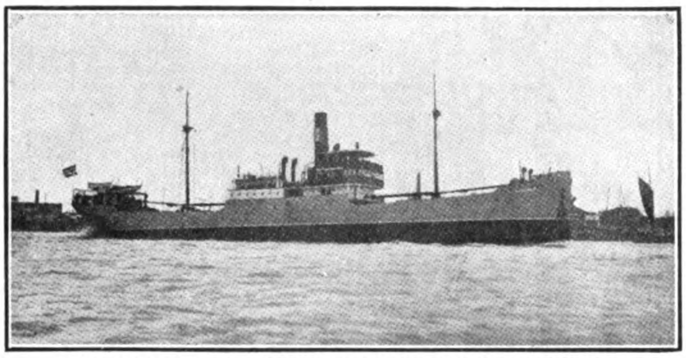

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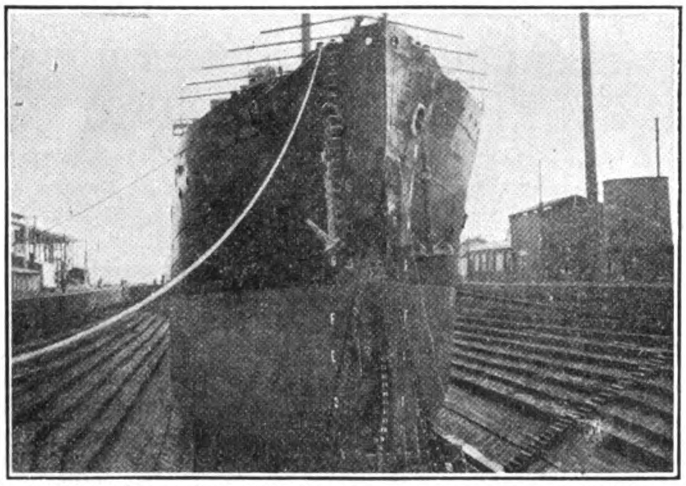

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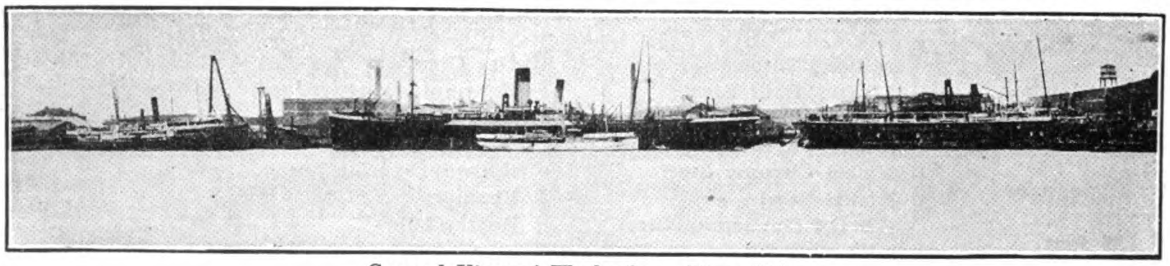

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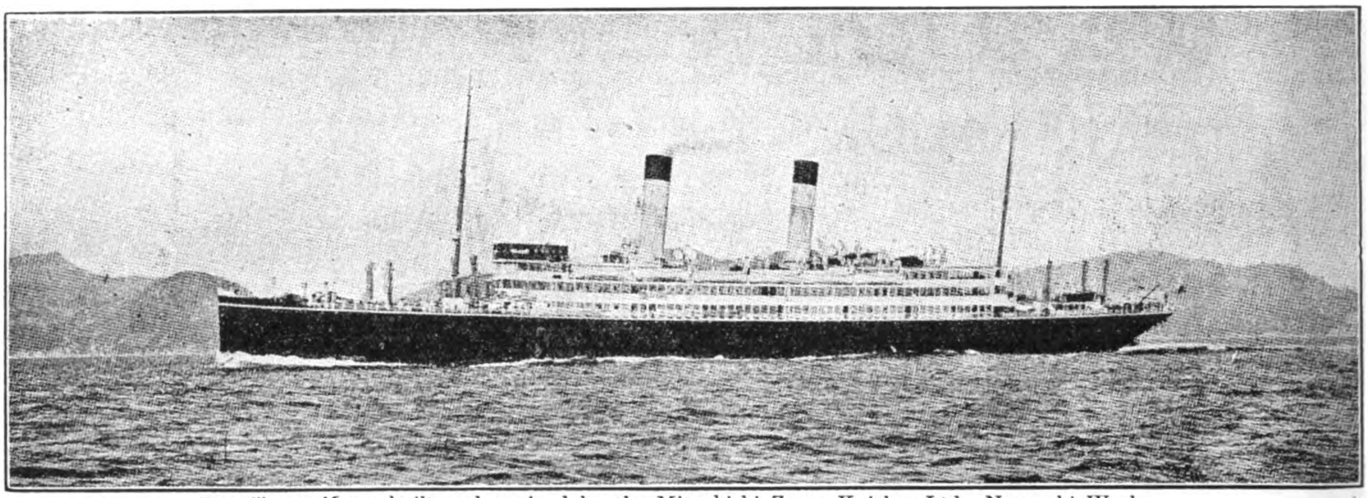

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DOCK No. 1			DOCK No. 2			DOCK No. 3		
Extreme Length	523	Ft.	Extreme Length	371	Ft.	Extreme Length	728.9	Ft.
Length on Blocks	513	,,	Length on Blocks	350	,,	Length on Blocks	714	,,
Width of Entrance on Top	89	,,	Width of Entrance on Top	66	,,	Width of Entrance on Top	99½	,,
,, ,, ,, ,, Bottom	77	,,	,, ,, ,, ,, Bottom	53	,,	,, ,, ,, ,, Bottom	88½	,,
Water on Blocks at Spring Tide	26½	,,	Water on Blocks at Spring Tide	24	,,	Water on Blocks at Spring Tide	34½	,,

THE BEST EQUIPPED SHIPBUILDING PLANT IN THE FAR EAST

With Special Facilities for Handling the Heaviest Castings and the Repairing or Building of Ships, Engines, and Boilers
Also Electrical Work

LARGE STOCK OF MATERIAL AND FITTINGS ALWAYS ON HAND

Star Brand Galvanized Sheets

STAR
—BRAND—
UNITED STATES STEEL
PRODUCTS COMPANY
NEW YORK. U. S. A.

THERE is frequent inquiry and a steady demand for a Galvanized Sheet with an EXTRA HEAVY COATING. To meet this situation we have placed on the market a special product which we are offering under STAR brand, as illustrated above, each and every sheet being stamped with this brand. This special sheet is made of special steel containing an alloy of copper, which is known as our "Keystone Copper Steel." This superior rust-resisting base is galvanized with an *extra heavy coating* of pure virgin zinc or spelter of the very best grade, thus insuring the greatest durability and effectiveness.

While the price of this extra quality sheet is quite naturally and necessarily higher than the well-known APOLLO brand, the charge therefor is only sufficient to cover the additional cost of manufacture. For Roofing and Siding of PERMANENT structures this high grade sheet is recommended without hesitation, the extra life more than making up for the increased first cost.

Our STAR brand sheets are offered only in formed material, such as Corrugated Roofing, Siding, Etc.

United States Steel Products Company

THE BUND AND CANTON ROAD, SHANGHAI, CHINA

22 WU LIANG TA JEN HUTUNG, PEKING, CHINA

15 NAKADORI MARUNOUCHI, TOKYO, JAPAN

MITSUBISHI IRON AND STEEL CO., LTD.

(MITSUBISHI SEITETSU KAISHA, LTD.)

HEAD OFFICE: MARUNOUCHI, TOKYO

CAPITAL: (PAID UP) YEN 30,000,000

MILL (LLOYD'S APPROVED) KENJIHO, CHOSEN (KOREA)

PRODUCTS PIG IRON—Basic & Foundry 100,000 tons.
STEEL—High Tensile & Mild Steel 50,000 tons.
BY-PRODUCTS—Sulphate of Ammonia; Pitch; Naphthalene; Tar Oil (light, middle, heavy); Slag-Cement, Slag Wool.

Sales Agents: **The Mitsubishi Trading Company, Limited**

BRANCHES AND AGENCIES: Tokyo, Yokohama, Nagoya, Osaka, Kobe, Moji, Wakamatsu, Karatsu, Nagasaki, Otaru, Tsuruga, Kure, Muroran, Hakodate, Kushiro, Vladivostok, Dairen, Kirin, Harbin, Peking, Shanghai, Hankow, Hongkong, Canton, Tientsin, Tsingtao, Tsinan, Singapore, London, Paris, Lyon, Marseilles, Berlin, New York, Seattle.

MITSUBISHI MARINE & FIRE INSURANCE Co., Ltd.

MITSUBISHI KAIJO KASAI HOKEN K. KAISHA

Head Office:
MARUNOUCHI, TOKYO

SUBSCRIBED CAPITAL - - Yen 5,000.000
PAID-UP CAPITAL - - - „ 1,250.000

Branches and Agencies:
LONDON, NEW YORK, OSAKA, KOBE, SHANGHAI, AND OTHER IMPORTANT CITIES AND PORTS IN THE WORLD

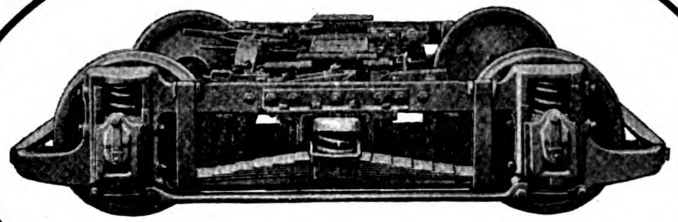
MITSUBISHI WAREHOUSE CO., LD.

(MITSUBISHI SOKO KAISHA, LTD.)

LANDING, SHIPPING AND FORWARDING AGENTS, STEVEDORES, CUSTOMS BROKERS & WAREHOUSEMEN

Head Office: MARUNOUCHI, TOKYO
Branches: TOKYO, YOKOHAMA, KOBE, OSAKA AND MOJI

General Managers of the
KYODO UNYU KAISHA
YOKOHAMA
3 KAIGAN-DORI, ITCHOME
YOKOHAMA
WITH TWO BRANCHES IN TOKYO



No. 77-E Truck
24 or 26-in. Wheels

For
Low-Level Cars

Far East Representative:
Andersen, Meyer & Co., Ltd., Shanghai
Pacific Commercial Co., Manila

BRILL

Main Office and Works
PHILADELPHIA, U.S.A.

THE J. G. BRILL COMPANY

Builders and Exporters

ELECTRIC TRAMCARS AND TRUCKS

Superior Barrel Shooks Bear This Trade Mark

CBCo

Made by CALIFORNIA BARREL CO., San Francisco

THE KOSTER COMPANY
12 NANKING ROAD, SHANGHAI
FOREIGN MANAGERS

CABLES "KOSTER"
ALL CODES

CALIFORNIA BARREL CO.
OF SAN FRANCISCO

TOSHIN SOKO

KABUSHIKI KAISHA

WAREHOUSING, FORWARDING AND EXPRESS CO.

SHIPPING BROKERS

LANDING STEVEDORES

CUSTOM HOUSE WAREHOUSEMEN

WAREHOUSING AREA - - - - - - - - - 77,000 tsubo (308,000 Sq. yds.)
VALUE OF GOODS IN WAREHOUSE (latest date) - - - Yen 275,000,000
CAPITAL (PAID UP) - Yen 5,000,000; RESERVE FUND - Yen 3,098,400

President: TOKUEMON MITSUI
Managing Directors: S. YADA and H. OKUMURA
Directors: K. HAYASHI and K. FUKUI
Auditors: T. MITSUI and T. MAJIMA

HEAD OFFICE: No. 5 HONKAWAYA-CHO, NIHONBASHI-KU, TOKYO

BRANCHES and SUB-BRANCHES:

TOKYO—Hakozaki-cho, Fukagawa-ku
OSAKA—Nakanoshima, Nishi, Utsubo, Aji-kawa, Nishinari, Sakurashima Chikuko
YOKOHAMA—Shinko-cho
KOBE—Kano-cho
MOJI—Hama-cho
SHIMONOSEKI—Kannonzaki-cho

MADE IN CANADA

WILLIAMS' SUPERIOR DROP-FORGED HAMMERS

Are dependable tools because :—

Their heads, drop-forged from a special grade of tough steel, carefully hardened and tempered, neither crack, chip nor splinter.

They are fastened most securely and solidly to the handles—can't work loose—can't fly off.

Their handles are made of the best grade of clear, straight-grained hickory, flared at the grip to prevent hand-slip.

The weight and length of each tool are properly proportioned to give perfect balance, and, hence, increased striking power.

Williams' Superior Hammers of all kinds and sizes.
Catalog on request.

J. H. WILLIAMS & CO., Ltd.

"The Drop-Forging People"

Works : St. Catharines, Canada

Export Office:
124 State Street,
New York, U.S.A.

London Representative :
Benj. Whittaker, Ltd.,
Department K.
56 Ludgate Hill, E. C. 4.

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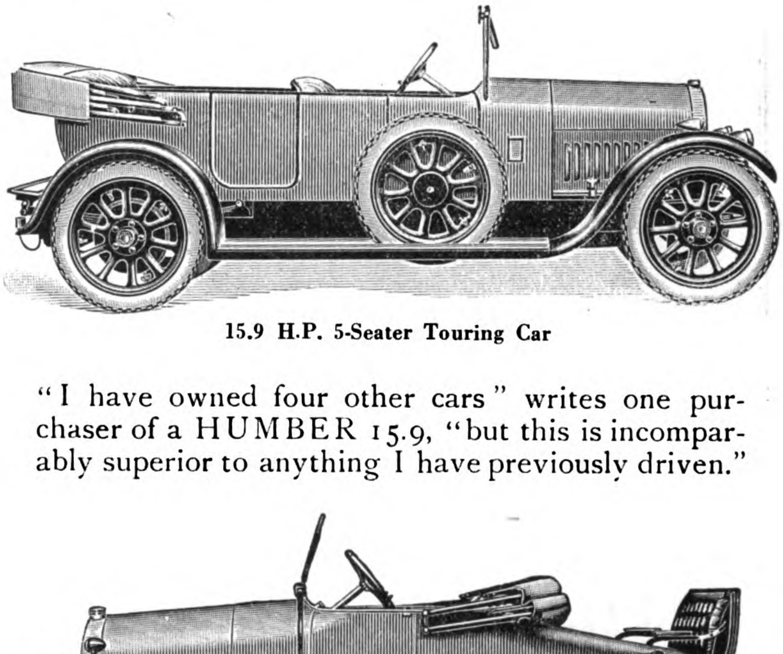
Humber CARS

The more critical you are in the choice of a car, the more will HUMBER quality—outstanding and never-varying—appeal to your sense of what a car ought to be.

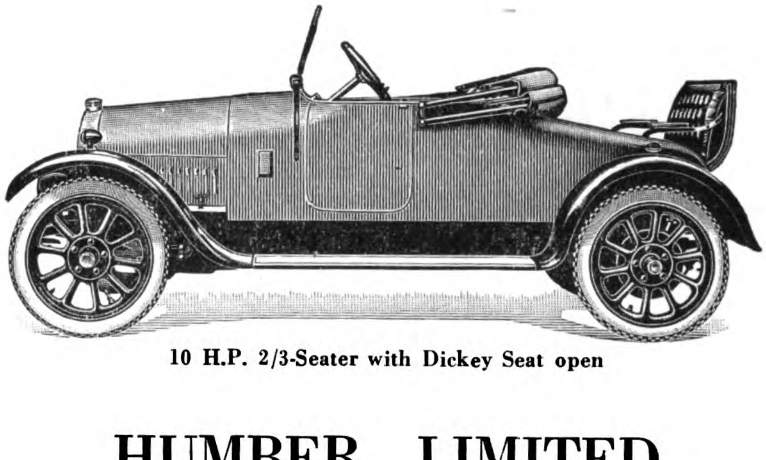
For the HUMBER CAR is built up to sound engineering standards. It has all the speed and every comfort of the most expensive car on the market without its heavy running expenses, and high costs for maintenance.

Riding-comfort over all roads comes from its well-sprung chassis and luxurious bodywork. Economy of upkeep and low cost for repairs result from its unique engine-design. Some cars are naturally extravagant of fuel. The HUMBER yields a full return for every pint of petrol, every drop of oil consumed.



15.9 H.P. 5-Seater Touring Car

"I have owned four other cars" writes one purchaser of a HUMBER 15.9, "but this is incomparably superior to anything I have previously driven."



10 H.P. 2/3-Seater with Dickey Seat open

HUMBER LIMITED

WORKS

COVENTRY, ENGLAND

THE BLUE FUNNEL LINE

(Ocean Steam Ship Co., Ltd. & China Mutual S.N. Co., Ltd.)

FAST SERVICES:—

Japan, China, Hongkong, Philippines, Straits and Java to Europe via Suez Canal and to New York via Suez and Panama Canals also

Trans-Pacific between Oriental ports and West Coast of N. America.

Agents: **BUTTERFIELD & SWIRE**

CHINA NAVIGATION CO., LTD.

(PASSENGER AND FREIGHT STEAMSHIP SERVICES)

SHANGHAI TO, AND FROM,

Weihaiwei, Chefoo and Tientsin (for Peking); Newchwang; Antung.
Hankow, Ichang (with connection to Chungking), Changsha, and Intermediate Yangtsze Ports.
Hongkong and Canton; Amoy and Swatow; Ningpo; and General Coasting Services.

HONGKONG TO, AND FROM,

Manila, Cebu, and Iloilo
Weihaiwei, Chefoo and Tientsin (for Peking)
Canton; Hoihow, Pakhoi and Haiphong; Bangkok and Singapore.
Shanghai and Yangtze Ports (as above)
Sydney, Melbourne and Australian Ports (Australian-Oriental Line)

Agents: **BUTTERFIELD & SWIRE**

FIRE AND MARINE INSURANCE

FIRE

London and Lancashire Insurance Co., Ltd.
Royal Exchange Assurance Corporation.
Guardian Assurance Co., Ltd.
Orient Insurance Company.
British Traders Insurance Co., Ltd.

MARINE

British and Foreign Marine Insurance Co., Ltd.
Standard Marine Insurance Co., Ltd.
Royal Exchange Assurance Corporation.
Sea Insurance Company, Ltd.
Guardian Assurance Co., Ltd.

Agents: **BUTTERFIELD & SWIRE**

TAIKOO SUGAR REFINING CO., LTD.

FINEST CANE SUGARS

General Agents: **BUTTERFIELD & SWIRE**

TAIKOO DOCKYARD & ENGINEERING CO.

OF HONGKONG, LTD.

SHIPBUILDERS, SHIP REPAIRERS, ENGINE BUILDERS, BOILERMAKERS, ETC.

Agents: **BUTTERFIELD & SWIRE**

Telephone No. 4881 Central. Private Exchange to all Departments

BUTTERFIELD AND SWIRE

Hongkong, Shanghai, Ningpo, Chinkiang, Nanking, Wuhu, Kiukiang, Hankow, Changsha, Ichang, Tientsin, Newchwang, Harbin, Dairen (Dalny), Tsingtau, Chefoo, Foochow, Amoy, Swatow, Canton, Yokohama, Kobe.

KOKUSAI KISEN KAISHA

Nominal Capital	- -	Yen 100,000,000.00
Paid-up Capital	- -	„ 87,500,000.00
Aggregate Tonnage	- -	500,000 Tons

FLEET OF STEAMSHIPS

Name	Tons D.W.	Name	Tons D.W.
Rozan-Maru	8,700	Seifuku-Maru	9,100
Vancouver-Maru	9,100	Suez-Maru	6,600
Boston-Maru	8,800	Daio-Maru	9,000
Tofuku-Maru	9,100	Kashu-Maru	8,800
Chifuku-Maru	9,100	No. 2 Kifunesan-Maru	5,000
Ryufuku-Maru	9,100	Yousan-Maru	5,000
Hankow-Maru	6,400	Taisan-Maru	5,000
Yoni-Maru	11,000	Yuri-Maru	11,000
Taibu-Maru	8,900	Texas-Maru	11,000
San Francisco-Maru	9,100	Tamatsu-Maru	6,600
Naple-Maru	9,100	Eifuku-Maru	9,100
Glasgow-Maru	9,100	Kifuku-Maru	9,100
Yayoi-Maru	8,700	Toyofuku-Maru	9,000
Yaye-Maru	11,000	Raifuku-Maru	9,100
Malta-Maru	8,700	Keifuku-Maru	9,100
Buyo-Maru	8,800	Washington-Maru	9,100
Brazil-Maru	9,100	Tokufuku-Maru	9,100
Kofuku-Maru	9,100	Portland-Maru	9,100
Yezari-Maru	6,900	England-Maru	9,100
Yugao-Maru	5,000	Chili-Maru	9,100
Yubaye-Maru	5,000	Argentine-Maru	9,100
Sydney-Maru	6,400	Port Said-Maru	9,100
Shanghai-Maru	6,400	New York-Maru	9,100
Singapore-Maru	9,100	Karorin-Maru	6,400
Jyufuku-Maru	9,100	Tasmania-Maru	6,400
Hiyeizan-Maru	6,700		

Head Office: No. 8 Kaigan-dori, Kobe

BRANCH OFFICE:

Tokyo Kaijo Building, Maruno-uchi, Tokyo, Japan

Osaka Shosen Kaisha

(Osaka Mercantile Steamship Co.)

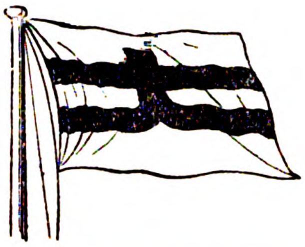
HEAD OFFICE: OSAKA, JAPAN

Cable Address: "SHOSEN, OSAKA."

Branches and Agencies at all the important ports in the World.

Codes Used: A1, A.B.C. 5th Ed.,

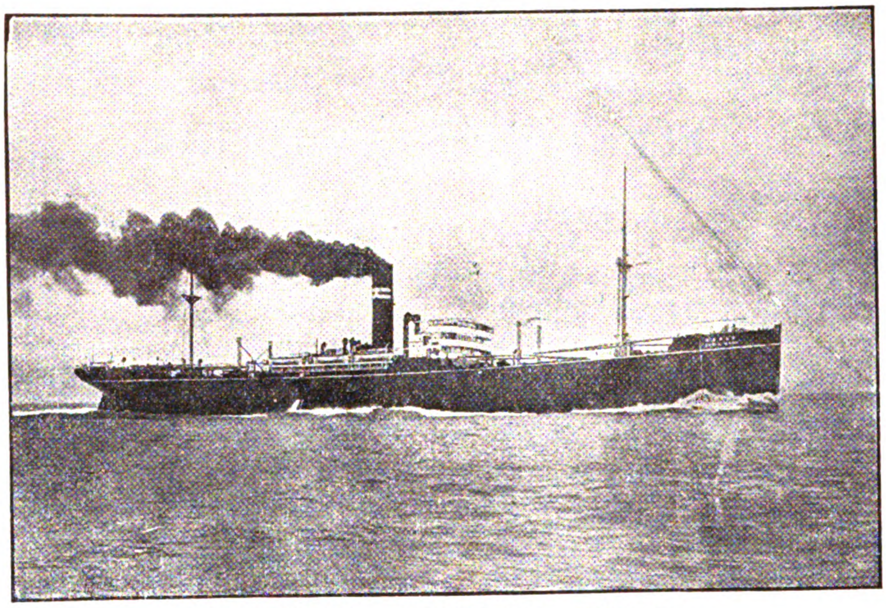
Scott's 10th Ed. & Bentley's.



Capital: Y. 100,000,000

Reserves: Y. 66,000,000

40 Regular Lines with a Fleet of 500,000 Tons Gross.



PRINCIPAL REGULAR LINES:

JAPAN-EUROPE LINE (via Suez)—Monthly—Ports of Call: Yokohama, Kobe, Moji, Shanghai, Hongkong, Singapore, Colombo, Port Said, Marseilles, London, Antwerp, Rotterdam and Hamburg.

JAVA-EUROPE LINE:—Monthly—Ports of Call: Sourabaya, Padan, Colombo, Port Sudan, Suez, Genoa, Marseilles, Antwerp and Hamburg.

CALCUTTA-NEW ORLEANS LINE: 7 sailings per annum—Ports of Call: Calcutta, Singapore, Hongkong, Nagasaki, Kobe, Yokohama, San Francisco, Balboa, Cristbal, Cienfuegos and New Orleans.

SINGAPORE-NEW YORK LINE:—Monthly—Ports of Call: Singapore, Hongkong, Shanghai, Moji, Kobe, Yokohama, San Francisco, Balboa, Cristbal, Havana and New York.

JAPAN-BOMBAY LINE:—Fortnightly—Ports of Call: Yokohama, Yokkaichi, Osaka, Kobe, Moji, Hongkong, Singapore, Colombo and Bombay.

HONGKONG-PUGET SOUND LINE:—Fortnightly—Ports of Call: Hongkong, Manila, Keelung, Shanghai, Nagasaki, Kobe, Yokkaichi, Shimizu, Yokohama, Victoria, Seattle, Tacoma and Vancouver.

JAPAN-SOUTH AMERICA LINE:—Monthly—Ports of Call: Yokohama, Kobe, Nagasaki, Hongkong, Singapore, Colombo, Mauritius, Durban, Cape Town, Rio de Janeiro, Santos and Buenos Ayres.

JAPAN-AUSTRALIA LINE:—Monthly—Ports of Call: Yokohama, Kobe, Osaka, Moji, Hongkong, Manila, Sydney, Melbourne and Adelaide.

JAPAN-JAVA LINE:—Monthly—Ports of Call: Osaka, Kobe, Moji, Keelung, Manila, Sandakan, Tawao, Batavia, Sourabaya and Macassar.

SERVICES TO CHINA.—

OSAKA—Dairen Line.—Semi-Weekly.
OSAKA—Tientsin Line.—6 Sailings per month.
OSAKA—Tsingtau Line.—2 Sailings per month.
YOKOHAMA—Dairen-Tientsin Line.—About 8 Sailings per month.
TAKAO—Tientsin Line.—2 Sailings per month.
Keelung-Hongkong Line.—Weekly.

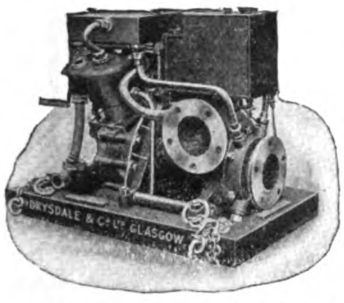
Besides the above mentioned, Mail and Passenger Services are maintained by over THIRTY-FIVE REGULAR LINES, calling at all important ports in JAPAN, as well as STRAITS, DUTCH EAST-INDIES, FORMOSA, CHINA, KOREA, Etc., Etc.

COMPANY'S LOCAL OFFICES IN CHINA

AMOY, CANTON, FOOCHOW, HANKOW, SHANGHAI, TIENTSIN, DAIREN, HONGKONG

"BON ACCORD"

CENTRIFUGAL PUMPS



FOR ALL PURPOSES

DRIVEN BY STEAM, ELECTRICAL, GAS, OIL, OR BELT POWER.

Illustration shews a 4″ Portable Petrol Driven Pump easily carried by two men. Capacity 90 tons water P. Hr. Specially arranged for dealing with muddy water.

FOR MARINE SALVAGE

CONTRACTORS, IRRIGATION, FLOOD DRAINAGE, ETC., ETC.

DRYSDALE & Co., Ltd., Yoker, Glasgow

Tel. Address: Bonaccord, Glasgow

Letters :
P.O. Box 855

G. VAN GELDER

Cables: CATAI
All codes

Reguliers gracht 29
AMSTERDAM (Holland)

羊
腸

Importer of

Кишки
Барановъ

SHEEP CASINGS

and all other animal products

Require offers, samples and consignments. Bank reference. De Hollandsche Bank voor de Middell. Zee. (The Dutch Bank for the Mediterranean—Amsterdam.)

Correspondence in English, Chinese or Russian

Code No. 5020
Magneto Telephone

"USE IS THE TEST"

MANUFACTURERS
of
High Grade
TELEPHONE APPARATUS

Plans and Specifications
furnished for
Complete Telephone
SYSTEMS.

Village, City and Long
Distance Service

KELLOGG SWITCHBOARD & SUPPLY CO.

Head Office & Factory,
Chicago, U.S.A.

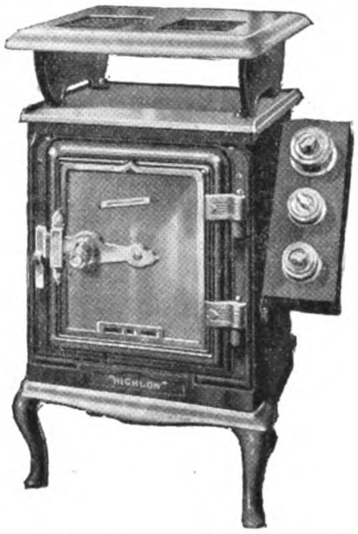
Tel. Add.
"SWITCHBOARD"

Far Eastern Branch
No. 62 Kiangse Rd.
SHANGHAI.

Electric Cooking "HIGHLOW" Apparatus

No. 50. IRON. Loading 500 Watts. Weight 6lbs.

Thumb rest.
Strong Tip-up Stand.
Best Nickel-plated finish.



ELECTRIC COOKER. Total Loading 4 kw.

No. 60. ELECTRIC KETTLE. 750 Watts.
Polished Copper or Nickel-plated, 2 pints Capacity.

Elements are wound on clear ruby mica with nickel contacts taken direct to the terminals.

Heating and Cooking Apparatus for Domestic, Ship's and Restaurant use.

Catalogue on request to the Sole Makers:

Archibald Low & Sons, Ltd.

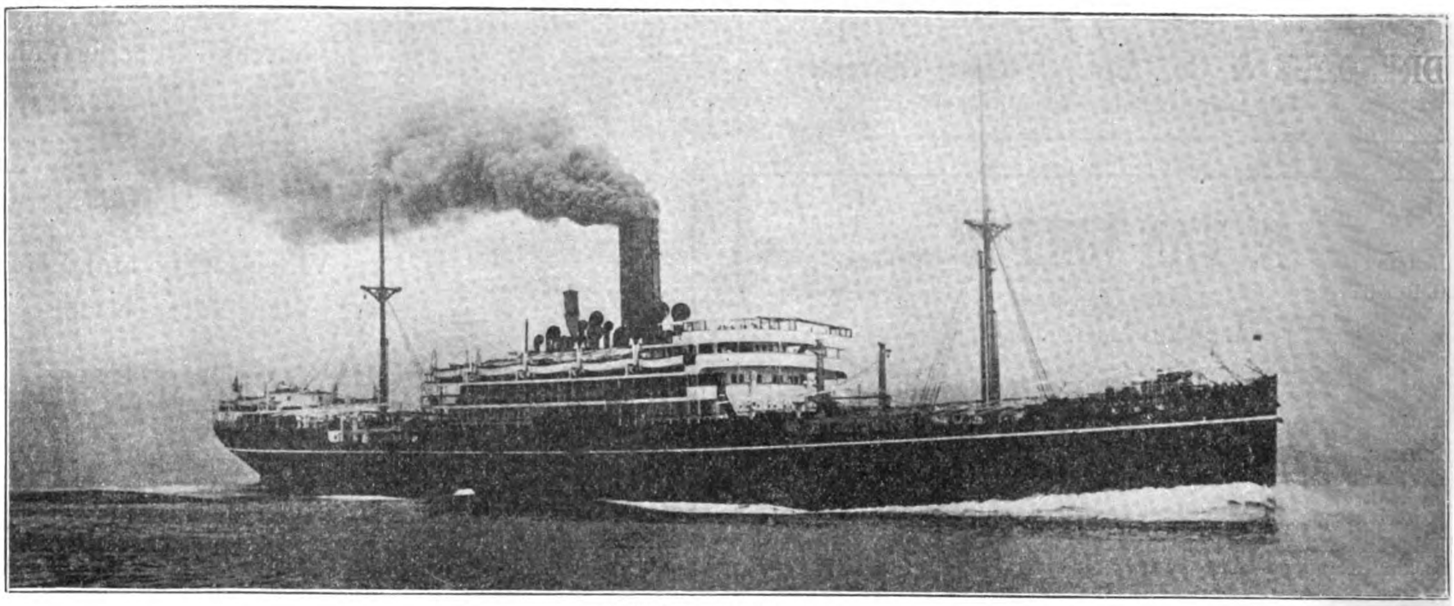
Merkland Works, Partick, Glasgow, Scotland

Telegrams :
"Highlow, Glasgow"

Code : A.B.C.

NIPPON YUSEN KAISHA

HEAD OFFICE, TOKYO, JAPAN



"SUWA MARU"

OVER THE

THE PALATIAL STEAMERS OF THE N.Y.K.

WILL CARRY YOU IN COMFORT, CLEANLINESS AND WITH COURTESY

PRINCIPAL SERVICES

EUROPEAN LINE (Fortnightly)

WEST COAST LINE (Monthly).
GLASGOW, BIRKENHEAD, AND SWANSEA (occasionally).
SINGAPORE, HONGKONG, SHANGHAI AND JAPAN.

NORTH CONTINENTAL LINE (Monthly).
HAMBURG, GRANGEMOUTH, ROTTERDAM AND ANTWERP.
STRAITS, JAVA, CHINA AND JAPAN.

NORTH AMERICAN LINE (Every 3 Weeks).
HONGKONG, MANILA, SHANGHAI, KOBE AND YOKOHAMA.
VICTORIA, B.C., AND SEATTLE.

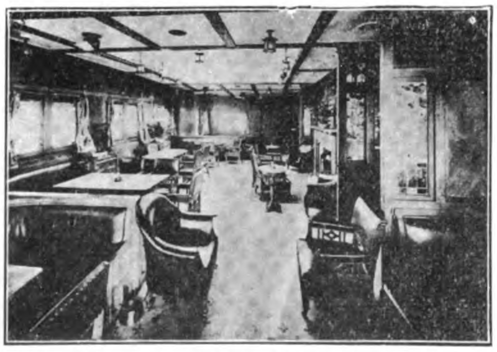
SOUTH AMERICAN LINE (Every 2 Months)
KOBE, SINGAPORE, DURBAN AND CAPETOWN.
SANTOS, RIO DE JANEIRO AND BUENOS AIRES.

AUSTRALIAN LINE (Monthly).
YOKOHAMA, KOBE, HONGKONG, MANILA, ZAMBOANGA, THURSDAY ISLAND, TOWNSVILLE, BRISBANE, SYDNEY AND MELBOURNE.

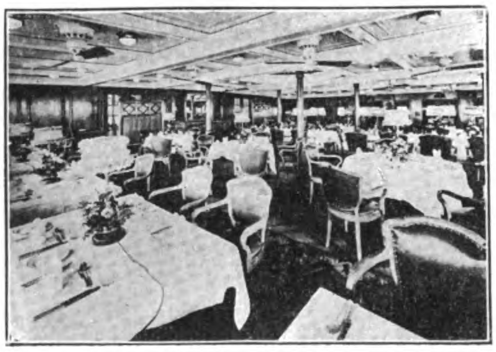
BOMBAY LINE (Fortnightly).
KOBE, SHANGHAI, HONGKONG, SINGAPORE, MALACCA, COLOMBO, TUTICORIN AND BOMBAY.

CALCUTTA LINE
(FORTNIGHTLY) YOKOHAMA, KOBE, HONGKONG, SINGAPORE, PENANG, RANGOON AND CALCUTTA.
(MONTHLY) CALCUTTA, MADRAS, COLOMBO, SUEZ, PORT SAID, ALGIERS AND NEW YORK.

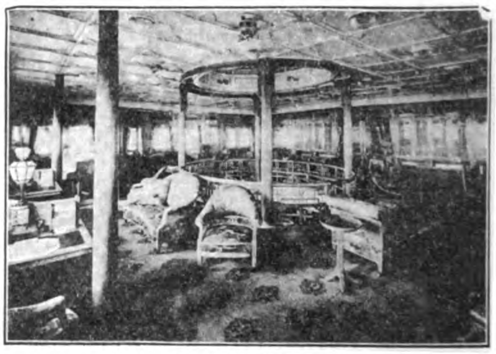
NEW YORK-FAR EAST LINE (Fortnightly)
KOBE, YOKOHAMA, SAN FRANCISCO, PANAMA, COLON, HAVANA AND NEW YORK.
NEW YORK TO JAPAN, CHINA AND PHILIPPINES.



Smoking Room



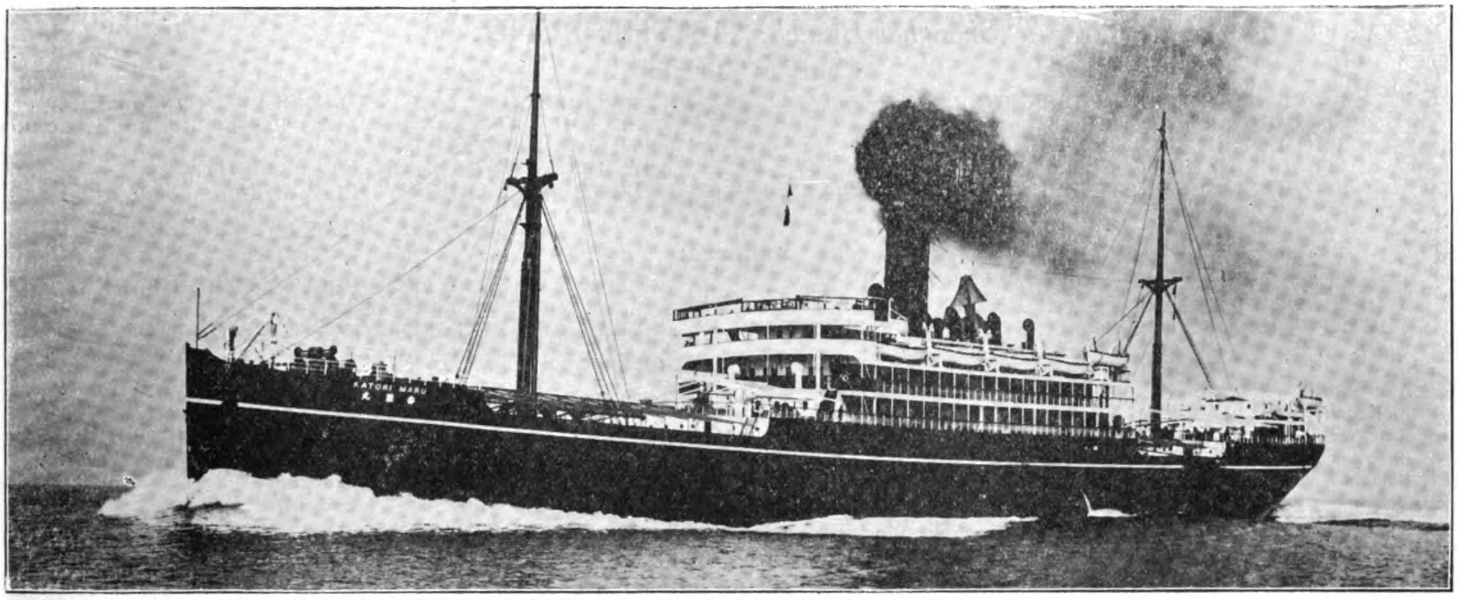
Dining Saloon



Social Hall

NIPPON YUSEN KAISHA

FLEET: 114 STEAMERS, 574,594 GROSS TONS



"KATORI MARU"

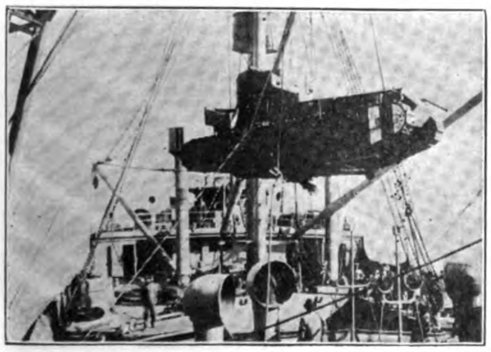
SEVEN SEAS

SHIPPERS WILL FIND QUICK DISPATCH, WITH WHARF, WAREHOUSE AND TERMINAL FACILITIES AT ALL PRINCIPAL PORTS SERVED BY N.Y.K. STEAMERS

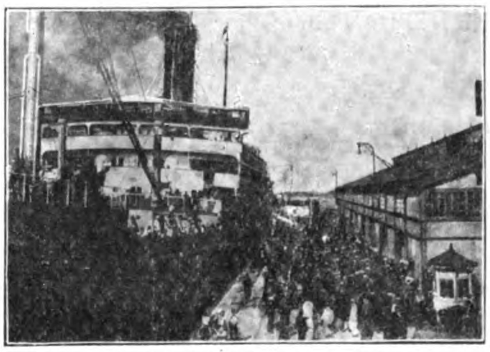
PRINCIPAL BRANCHES AND AGENCIES

Yokohama	Tokio	Nagoya	Keelung
Kobe	Moji	Nagasaki	Hankow
Hakodate	Otaru	Tientsin	Singapore
Tsingtao	Hongkong	Canton	Bombay
Penang	Colombo	Calcutta	Liverpool
Port Said	Marseilles	London	Chicago
Antwerp	Rotterdam	New York	Brisbane
Seattle	Manila	Townsville	Shanghai
Sydney	Melbourne	Osaka	

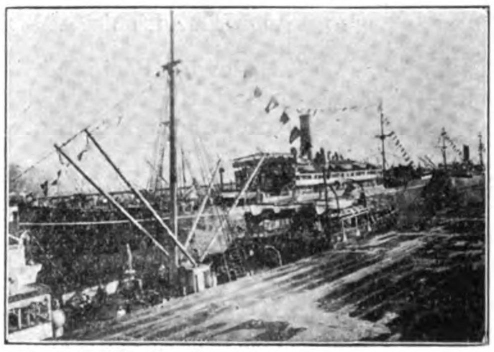
GIVE JAPANESE STEAMSHIPS THEIR SHARE OF YOUR JAPANESE CARRYING TRADE



Landing a Tank



Dock at Yokohama



Great Northern Dock at Seattle

Chartered Bank of India, Australia and China

INCORPORATED BY ROYAL CHARTER, 1853

Capital	**£3,000,000**
Reserve Fund	**£3,600,000**
Reserve Liabilities of Shareholders	**£3,000,000**

Head Office: 38 BISHOPSGATE, LONDON, E.C.

Shanghai Branch: 18 THE BUND.

Court of Directors:

SIR MONTAGU CORNISH TURNER, *Chairman.*
SIR DUNCAN CARMICHAEL
THOMAS CUTBERTSON, Esq.
SIR ALFRED DENT, K.C.M.G.
SIR WILLIAM HENRY NEVILLE GOSCHEN, K.B.E.
THE RIGHT HON. LORD GEORGE HAMILTON, G.C.S.I.
SIR JOHN NEWALL JORDAN, P.C., G.C.I.E., K C.B., K.C.M.G.
WILLIAM FOOT MITCHELL, Esq.
JAMES MAXWELL GRANT PROPHIT, Esq.
LEWIS ALEXANDER WALLACE, Esq.

Chief Manager: W. E. PRESTON

Managers: J. S. BRUCE & G. MILLER

Bankers:

THE BANK OF ENGLAND.
THE LONDON JOINT CITY & MIDLAND BANK, LTD.
THE LONDON COUNTY WESTMINSTER & PARR'S BANK, LTD.
THE NATIONAL PROVINCIAL & UNION BANK OF ENGLAND, LTD.
THE NATIONAL BANK OF SCOTLAND, LTD.

Agencies and Branches:

Alor Star (Kedah)	Bombay	Colombo	Iloilo	Kuala-Lumpur (F.M.S.)	New York	Saigon	Taiping (F.M.S.)
Amritsar	Calcutta	Delhi	Ipoh	Madras	Peking	Seremban	Tavoy
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The Far Eastern Review

ENGINEERING FINANCE COMMERCE

VOL. XVIII SHANGHAI, APRIL, 1922 No. 4

Huge Electrical Expansion in Japan

A Survey of Actual Markets for Materials

1. Hydro-Electric Enterprises

By B. C. HUGINS

AT the end of 1920 there were in Japan 831 companies generating electric power from hydro-electric installations. The total capital investment in those companies was Y.1,369,400,000, and according to the investigations of the department of agriculture and commerce the total power licensed for development by these 831 companies was 7,404,000 kilowatts. The total power developed by operating companies was 1,254,000 kw. Enterprises licensed but not yet operating will develop another 2,756,000 kw., and licensed applied for but not granted call for the development of 3,394,000 kw.

Many of these concerns were established in the heydey of Japanese prosperity when it was a simple matter to raise capital, but since the slump of 1920 a large part of those not yet licensed have been abandoned. There were many good prospects among them, but also many weak valueless concerns.

The minister of agriculture and commerce in a speech at the end of 1921 announced that there were Y.1,600,000,000 then invested in hydro-electric enterprises, generating 1,340,000 kilowatts. In this speech the minister deplored the tendency to rush into new hydro-electric enterprises without considering the needs of the different parts of the country, and strongly urged his hearers to amalgamate their conflicting interests and thereby save many duplications of equipment which were only a costly drain on the finances of the nation.

Before this official appeal for amalgamations and annexations was made there had already been a growing tendency for the larger corporations to absorb the smaller concerns operating in or contributing to the power needed in their supply districts. Newly organized companies possessing valuable water rights were especially desirable purchases for old concerns, and the amalgamations carried out in 1921 strengthened the industry and the nation as a whole.

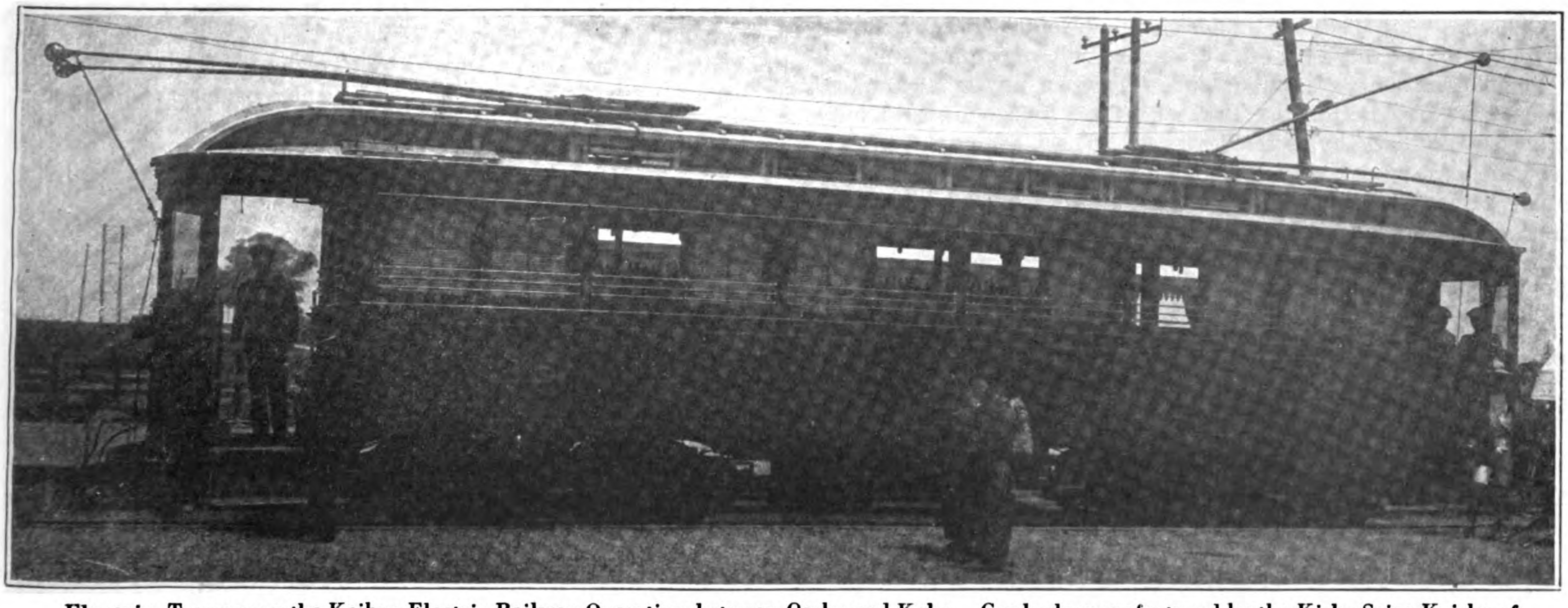
The Kwanto-Eastern District

In the Kwanto, the district of Japan covering Sagami, Izu, Musashi, Kosuke, Shimosuke, Hidachi, Kazosu, Shimosa provinces, east of the Hakone mountains, including the cities of Yokohama and Tokyo, is the most important population centre in all Japan, and the centre of the greatest power interests now operating.

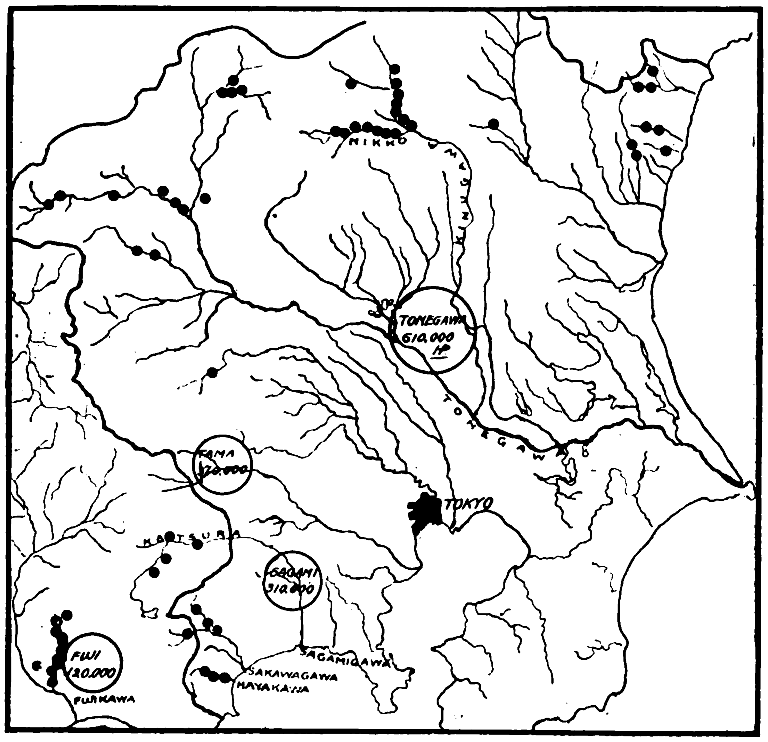
The most important water powers in this district are supplied by

1. The Tonegawa (river) and its branches.
2. The Sagamigawa.
3. Other minor rivers and their tributaries.

The Tonegawa water shed extends over the prefectures of Gunma, Tochigi and Saitama. There are more generating plants along this river and its branches than in any other part of Japan, and the generating stations are for the most part the largest in



Electric Tramcar on the Keihan Electric Railway Operating between Osaka and Kobe. Car body manufactured by the Kisha Seizo Kaisha of Osaka and equipped with four Dick Kerr Traction Motors, Type D-K, 9-C, 5 H.P.



The Kwanto District of Japan. Hydro-Electric Plants in Operation, 2,000 Kilowatts and upwards

the country. There are 133 generating stations in all, producing 612,000 kilowatts distributed by forty operating companies.

The principal companies operating in the basin of the Tonegawa are—

Company	River Basin	Power developed
Kinugawa Suiryoku Denki	Kinugawa	55,440 kilowatts
Nikko Denki Kido (Electric Railway)..	Daiyagawa	180 ,,
Shimotsuke Denryoku (Now Tokyo Dento)	,,	2,060 ,,
Shimotsuke Denryoku (Now Tokyo Dento)	Kinugawa	3,650 ,,
Takasaki Suiryoku Denki ..	Karasugawa	1,800 ,,
Tonegawa Hatsuden Sho (Now Tokyo Dento)	Katashinagawa	22,556 ,,
Gunma Denryoku	Agatsumagawa	28,963 ,,
Kwanto Suiryoku Denki ..	Tonegawa	20,000 ,,
Musashi Suiden	Jinryugawa	1,100 ,,
Musashi Suiden	Arakawa	1,800 ,,

The most important companies in the Kwanto to-day are the Tokyo Dento, the old Tonegawa Hatsuden Sho, now amalgamated with the Tokyo Dento, the Shimotsuke Denryoku, now amalgamated with the Teikoku Dento, the Takasaki (City) Suiryoku, the Kinugawa Suiryoku and the Musashi Suiden. These companies to-day have a generating capacity of 600,000 kilowatts, while their plans for the future call for the development of another 300,000 kilowatts. The Shikanuma Suiryoku Denki utilizing the waters of the Oashigawa has not yet completed an ambitious new project to supply some 20,000 kilowatts.

The other rivers in the Kwanto and some of the more important companies located along them are—

Arakawa :	Musashi Suiden.
	Kwanto Suiden.
Tamagawa :	Kwanto Suiden.
Sakagawa :	Sagami Suiryoku.
	Fuji Gasu Boseki Denryoku Ba.
Hayakawa :	Yokohama Denki, now Tokyo Dento.
	Odawara Dentetsu (Electric Railway.)
Agano River Basin :	Inawashiro Suiden.
Abukumagawa Basin :	Koriyama Denki.
	Tadami Gawa Suiryoku.
Fujikawa Basin:	Fuji Suiden.
	Hayakawa Suiryoku, which supplies power to the Keihin Denryoku Co. (Tokyo-Yokohama Electric Power Co.)

There are many other companies operating in the Kwanto but the centre of all of them is the powerful Tokyo Dento K.K. (Tokyo Electric Light Co., Ltd.) The Tokyo Dento has recently effected important amalgamations with the Nihon Dento, the Yokohama Dento and the Tonegawa Hatsuden Sho greatly increasing its capital to bring about the expansion of its boundaries and business. At the end of June, 1921, the authorized capital of the Tokyo Dento was Y.166,000,000. Its hydro-electric power plants generate 74,800 kilowatts, and its coal burning power plants add 29,700 kilowatts to that amount, making its total power generated, 95,500 kilowatts. It supplies 3,221,000 lights in and around Tokyo city, and sells 170,000 kilowatts for motive power, partly purchased from others. This company to-day is the greatest supplier of electric power in all Japan, and as it is increasing its equipment and power all the time, its future is very promising.

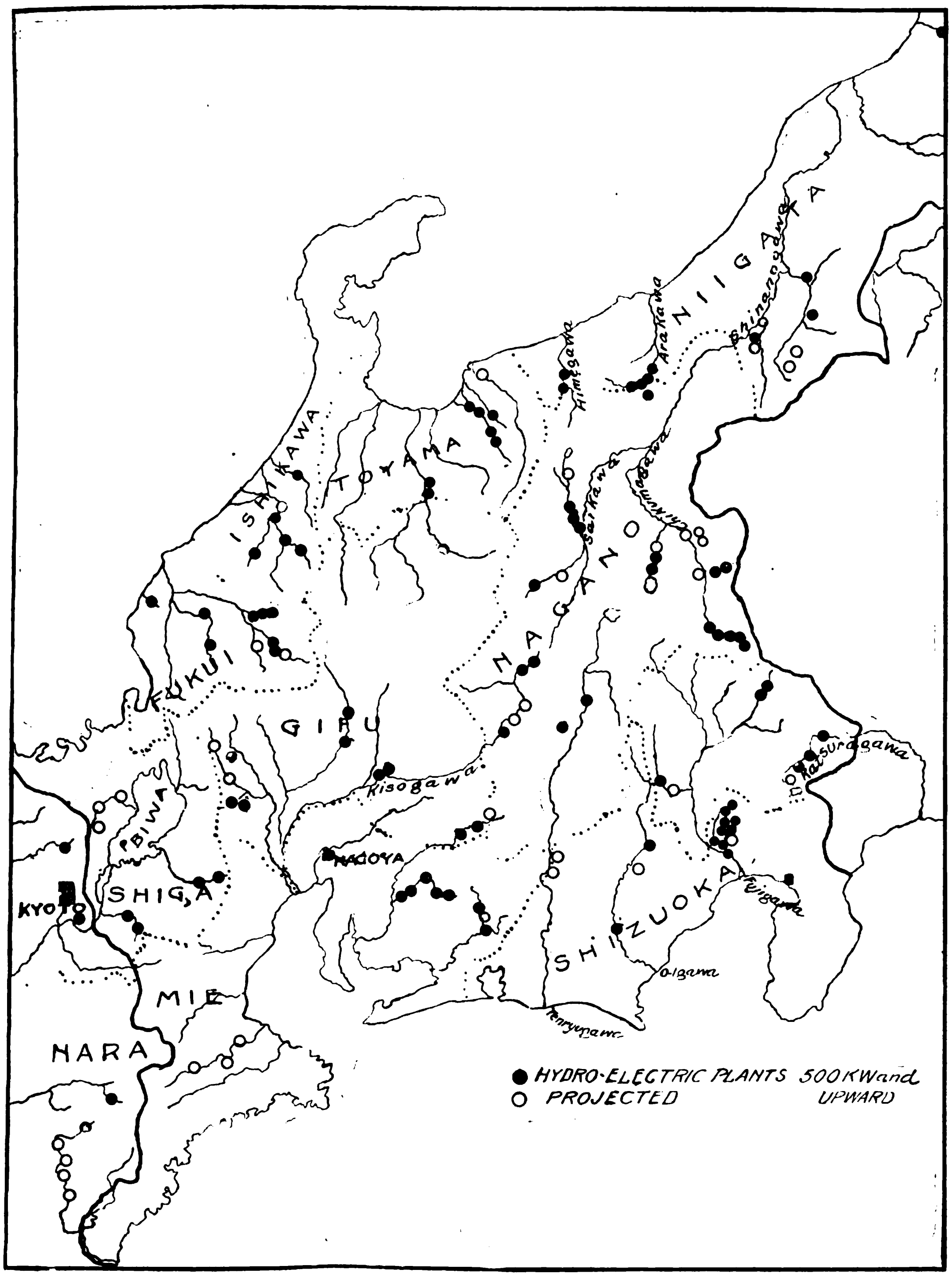
Since July, 1921, the Tokyo Dento has added to its organization the business of the Takasaki Suiryoku Denki, the Kumagawa Suiryoku, and the Nichiei Suiden and the Oshima Suiden, which, at first amalgamated with the Hayakawa Suiden, become the property of the Tokyo Dento when the Hayakawa company was absorbed in September, 1921. The Hayakawa before it fell into the hands of the Tokyo Dento was expanding its business in all directions, although its own construction plans were not yet completed. When its new power stations are completed they will generate 21,300 kilos from water power and 1,000 kilos from coal-burning plants. It was also rumored that the Tokyo Dento was contemplating the purchase of the Keihin Dentetsu (Tokyo-Yokohama Electric Railway), but this is denied by the action of the Keihin Dentetsu in purchasing the Gunma Denryoku which will generate 28,963 kilowatts when its plants are completed. By its purchases of the Takasaki Suiryoku it added 3,355 kilowatts, by the Kumagawa Suiryoku 2,386 kilowatts, and by the Hayakawa 6,100 kilowatts to its already large water power productive capacity. These companies also generalte small amounts of power from coal-burning plants, and all together they produce 15,000 kilowatts, a very welcome addition to the Tokyo Dento's supplies. Their combined capital before the annexation was Y 21,000,000.

Lately the Katsuragawa Suiryoku was also incorporated into the Tokyo Dento organization, adding another 33,000 kilowatts to its already great power supplies. The capital of the Katsuragawa was Y.42,000,000. It can be seen from these amalgamations that the water power of the Kwanto is slowly being concentrated under the control of the Tokyo Dento. The plans for future expansion of this company are very ambitious, and its constant reaching out for more and yet more power is a source of great anxiety to less favorably situated companies.

The Inawashiro Suiden has a capacity of 61,500 kilowatts, and it supplies power to Tokyo and Tokyo vicinity. Recently it entered into a contract of amalgamation with the Koriyama Denki and the Tadamigawa Suiryoku operating in the Abukawa (river) basin. The Koriyama generates 12,000 kilos, and the Tadami, which is still very young, supplies 500 kilos, but it has very valuable water rights which can be developed at very little cost. There are many small companies in the same river basin, the Fukushima Dento, Abugawa Suiryoku, Aiza Denryoku, etc., which will all probably be annexed to the Inawashiro in the near future.

The Kinugawa Suiryoku Denki K.K. is the third great company operating in the Kwanto. It generates 33,000 kilowatts, from water power and 13,000 kilowatts from coal. The Tokyo city electric bureau purchases 37,300 kilowatts from the Kinugawa.

These three companies are the great competitors for the business of electricity supply in Eastern Japan. But although there are



Map of Central Japan, showing Hydro-Electric Plants. ● In Operation, 500 Kilowatts and upwards, O Projected

many conditions existing to-day which tend to keep them apart, they will in all probability be combined in one large organization at no far distant date. Such a combination would be all powerful, in the Kwanto at least, and it would leave no room at all for any competitor to live in.

Central Japan, from Numadzu to Kobe

From the point of demand for power the Kansai district, centering around Osaka, is in no way behind the Tokyo district, the centre of the Kwanto. In Osaka and Kobe the demand for electric power is very great indeed, but water power is very scarce because there are no rivers in this district which have sufficient fall to make them valuable sources of power. Only in the basins of the Yodogawa and the Yamatogawa is there any available power. Practically all the water power which can be economically developed along those rivers has already been used up, consequently the Kansai is obliged to go outside its borders into the central districts, Chubu, the north-eastern part of Japan, the Hokuroku, and the Tokai, the district between Tokyo and Kyoto, in order to get power enough for its needs. These three districts are now competing for the business of the Kansai.

The Ujigawa Denki K.K. and the Daido Denryoku K.K. are the two great competitors for the business and power rights in this field. The Ujigawa Denki is a part of the earlier company the Kansai Suiryoku Co., and it still uses coal to generate power for most of its service. Its future prosperity has been threatened by the continual growth of the Daido Denryoku which has recently absorbed the Nihon Suiryoku, the Kiso Denki Kogyo and the Osaka Soden K.K.

The Ujigawa Denki, in competition, however, has made every effort to keep up with the Daido Denryoku, and it has entered into co-operative arrangements with the Nihon Denryoku, Wakayama Suiryoku, and the Kansai Denki, which was formerly the Nagoya Denki now annexed to the old Kansai Denki. These arrangements make the future of the Ujigawa, and the co-operating companies, secure against the growing power of the Daido Denryoku.

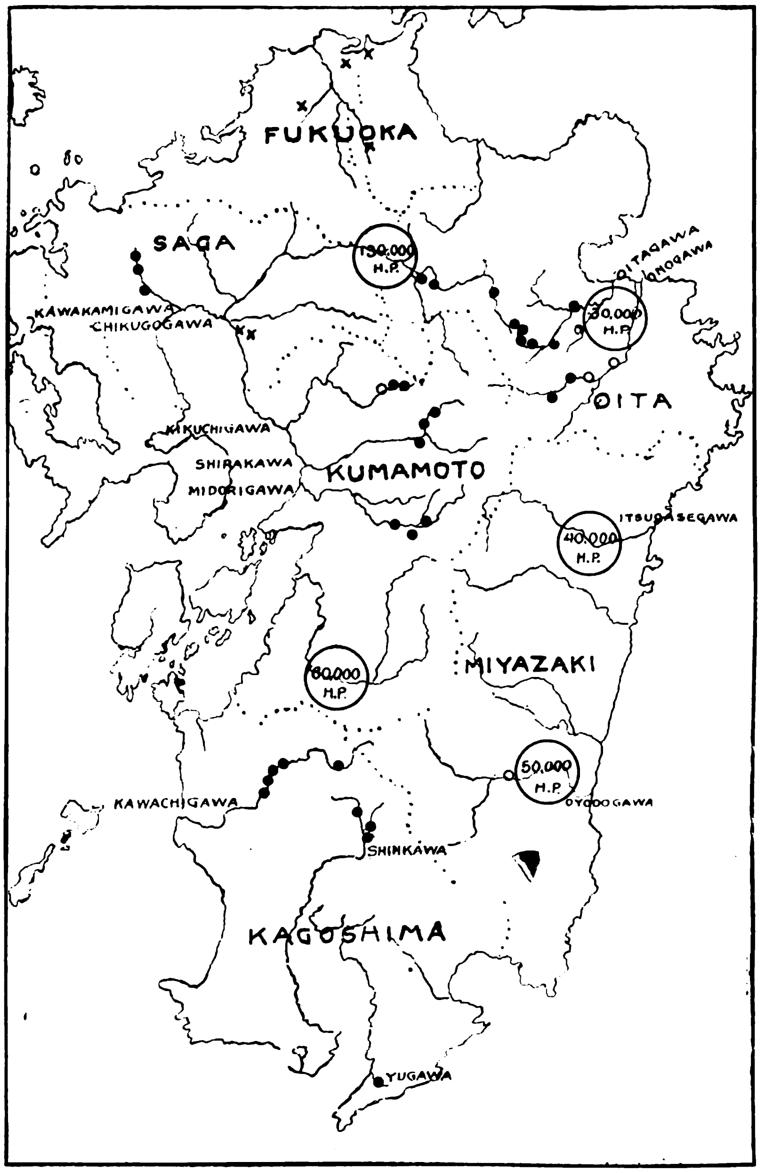
The following rivers capable of supplying power to generate more than 50,000 kilowatts are located in the Chubu, and the Hokuroku, and there are already many stations located on their banks:—

Kisogawa (Chubu)	73	sites.
Jinzugawa (Hokuroku)	42	„
Tenryugawa (Tokai)	77	„
Oigawa (Tokai)	17	„
Shokawa (Hokuroku)	30	„
Ibigawa (Chubu)	42	„
Kuzuryugawa (Hokuroku)	33	„
Yahagigawa (Chubu)	24	„
Saikawa (Hokuroku)	42	„
Joganjigawa (Hokuroku)	18	„

There are also many other small streams having potential power of less than 50,000 kilowatts, which added to those already given will produce 2,000,000 kilowatts, or about 27 per cent. of the total water power resources of Japan.

The important cities of Nagoya, Gifu, Ozaki, Hamamatsu, Toyohashi, Fukui, Kanazawa, and Toyama are all important industrial centres. But despite their potential value as users of power their needs have not assumed any very great proportions yet. Consequently it has not been possible to establish in these three districts, the Chubi, Tokai and Hokuroku, any great power companies having outlets in those cities alone. But now that the needs of Osaka are becoming more and more urgent the great Kansai companies are reaching out into them for power sites, and many plans are being considered for the development of their resources.

In the past few years the Kiso Denki Kogyo, Nihon Suiryoku, Osaka Soden, Nihon Denryoku, have all been established for the purpose of transmitting power to Osaka from these distant places. Excluding the Nihon Denryoku, the Daido Denryoku, with its capital of Y.100,000,000, promoted by the great electric power capitalist, Mr. Momosuke Fukuzawa, has absorbed all these com-

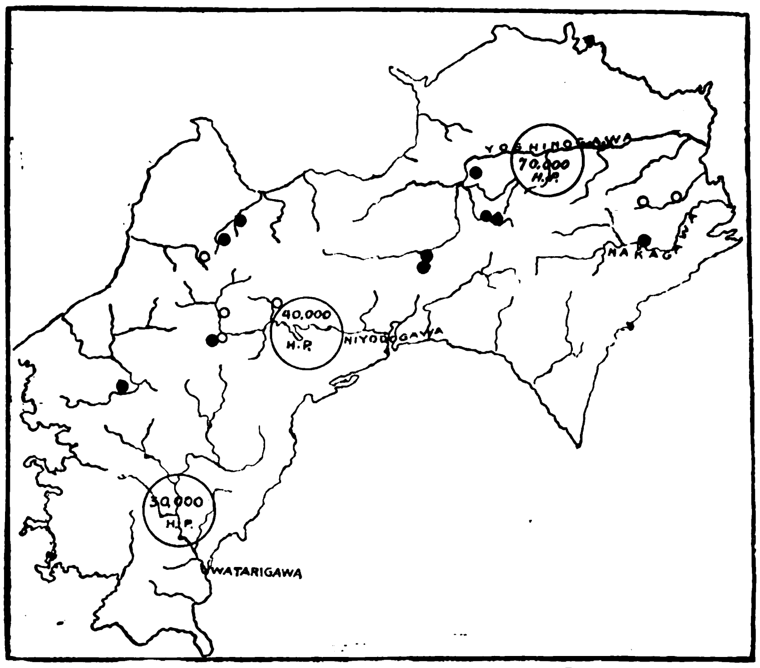


Map of Kyushu, showing Hydro-Electric Plants. ● Plants in Operation, 500 Kilowatts and upward; O Projected; X-Steam and Gas Power Plant

panies. The Daido has ambitious plans for absorbing other companies and extending its services ; it is said that the scope of these plans covers almost all the important industrial centres in Japan. Its power plants to-day are not producing much, only 24,800 kilowatts from the Kisogawa, Yahagigawa, and Kuzuryugawa. But this company has in course of construction power plants on the Kisogawa at Okuwa, and Suhara to generate 20,000 kilowatts, and at Tokushi, Komone and Oi on the Kisogawa, preparations are now being made to construct plants to generate 100,000 kilowatts more.

Scattered here and there through central Japan there are other companies which in the future will be in a position to generate 600,000 kilowatts. Osaka, Nara, Kobe and Wakayama are all in great need of cheap power, and are anxiously awaiting the extension of water power companies in their neighborhoods. It costs Y.12,000,000 to build the necessary transmission lines and stations between the Kisogawa and Osaka, but even this expense is not prohibitive, so necessary is power to these growing commercial centres.

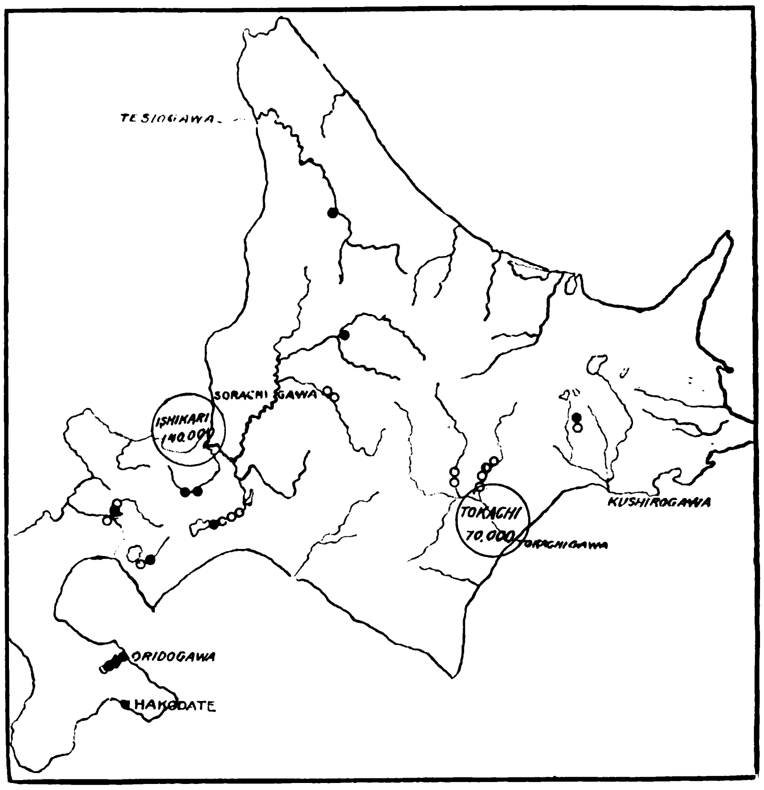
The Kansai Denki and the Daido Dento are in the hands of the same group of capitalists. The Kansai Denki recently amalgamated the Taisho Suiryoku Denki, operating in Nara prefecture, capitalized at Y.10,000,000. The Taisho Denki is planning to build four power stations to generate 19,600 kilowatts on the Kumanogawa in Wakayama prefecture, and on the Yoshino Gawa in Nara prefecture. The Wakayama Suiryoku has also been annexed recently, because it is a particularly valuable organization for the



Map of Shikoku, showing Hydro-Electric Plants. ● In Operation, 2,000 Kilowatts and upwards; Projected. O In Operation, 500 Kilowatts and under

supply of cheap power to Osaka city. It is reported that the Kansai Denki will soon annex the Itatorigawa Denki, the Mino Denki Hiryo, the Tenryugawa Suiryoku and the Yamashiro Suiryoku companies.

In Toyama and Ishikawa prefectures, in the Hokuroku district, there are many sites where enormous power can be developed. The Daido Denki is operating with the greatest success in these prefectures, and because of the capital relation between them the Daido and Kansai companies are now the greatest suppliers of power in central Japan. Perhaps they may even be able to realize their dream of obtaining control of all the important power sites remaining in the districts they are now operating in, and be able to extend their supply boundaries to Tokyo district.



Hokkaido Hydro-Electric Power Plants. ● In Operation, 500 Kilowatts and upward; O Projected

The plans for the expansion of these companies include the following distribution stations :—

Sakashita	Transformer	Station	250,000 kilowatts
One	,,	,,	80,000 ,,
Hatotani	,,	,,	100,000 ,,
Funatsu	,,	,,	200,000 ,,
Iida	,,	,,	110,000 ,,
		Total	740,000 ,,

Tokyo	Transformer	Station	100,000 kilowatts
Kozu	,,	,,	20,000 ,,
Hamamatsu	,,	,,	40,000 ,,
Nagoya	,,	,,	100,000 ,,
Kofu	,,	,,	10,000 ,,
Osaka	,,	,,	260,000 ,,

The Sakashita station will operate between Osaka and Nagoya a distance of 137 miles. The Funatsu station between Sabaya and Kaihei, and between Ono and Osaka stations, 212 miles. Between the Funatsu station and Nagoya is 108 miles, and from Sakashita to Tokyo is 187 miles, and from Nagoya to Kozu, 164 miles. From Nagoya to Sakashita and to Funatsu, then to Ono, and to Kozu is 309 miles. Adding all the lesser lines, the total transmission lines of these sister companies will be 1,400 miles long, and will cost Y.55,000,000.

In Toyama prefecture the authorities have been working since the spring of 1921 to bring about an amalgamation of the interests of many of the lesser hydro-electric companies owning power sites in important districts. Not all the companies have taken kindly to the official suggestions, but as a first step in the consummation of the plan the Oiwa Denki, the Fusegawa Suiryoku Denki, and the Aimoto Denki, decided to accept amalgamation with the interests of the Chuyetsu Hydro-Electric Co., capitalized at Y.1,600,000, and which is now, since the amalgamation, the most important water power company in Toyama prefecture. This amalgamation was completed in November, 1921, and it is expected to prove very advantageous to all the companies concerned.

Government Demand for Power in Kansai District

The imperial government department of railways is gradually electrifying its present steam lines and it requires more and more power every year. The whole cost of construction of the line between Tokyo and Kobe, the Tokaido, is estimated at Y.440,000,-000. In the eastern part of this line the Tokyo Dento, and in the west the Ujigawa, the Nihon Suiryoku, the Kyoto Dento, and the Daido Denki are all planning future developments to take advantage of the railway's needs.

The railway department plans to electrify all the railways running out of Tokyo city for many miles into the country. The first lines to be constructed will be those between Yokohama, Ofuna, and to Yokosuka, and from Kichijoji to Jacioji, and from Kanda to Chiba, a total of 127.6 miles. There are already in operation in and about Tokyo 58.3 miles of electric railways, government owned.

In the suburbs of Osaka the Joto line, and a part of the Katamachi line, seventeen miles in all, will also be electrified. The total mileage to be converted about Osaka and Tokyo only is 144, and the work, as now planned, is to be completed in 1926. The government's often broached plan to convert the existing trunk line railways to broad gauge has practically been shelved during the past few years by this plan to electrify the principal railway lines.

To operate these 144 miles by electricity a supply of 70,000 kilowatts of power is needed. The Yaguchi power plant supplies 4,500 kilowatts, and the Tokyo city electric bureau, the Tokyo Dento, the Kinugawa Suiryoku, are all together supplying 10,000 kilowatts to the government lines about Tokyo. The line over the Usui Toge, near Karuizawa, gets 2,500 kilowatts from the Yokogawa power plant owned by the government railways. But when these plans for conversion are actually constructed the government railways must be in a position to supply all its own power, without purchasing from outside companies. This will be a blow to some of the plans of the Daido Dento.

The government railways are now completing a coal-burning plant at Akabane, outside Tokyo, which will cost Y.5,000,000 when completed. It will be finished this spring, and will supply 15,000 kilowatts. The railways are also planning the construction of a great 65,000 kilowatts hydro-electric plant on the Shinano river, the largest river in Japan, which will cost Y.45,000,000. If this is completed by 1926 the railway department will have a supply of 84,200 kilowatts of electricity water generated, as well as a coal-burning plant supply of 15,000 kilowatts, a total of 99,200 kilowatts. But only 70,000 kilowatts of water power need be developed, so this plan allows for an excess of 14,000 kilowatts which can be counted on in case of need.

The imperial railway department has completed the plans for the electrification of the Tokaido railway line, between Tokyo and Kobe. All estimates of cost, however, have not yet been made, and it is doubted if it will be possible to present the bill for the approval of this session of the diet.

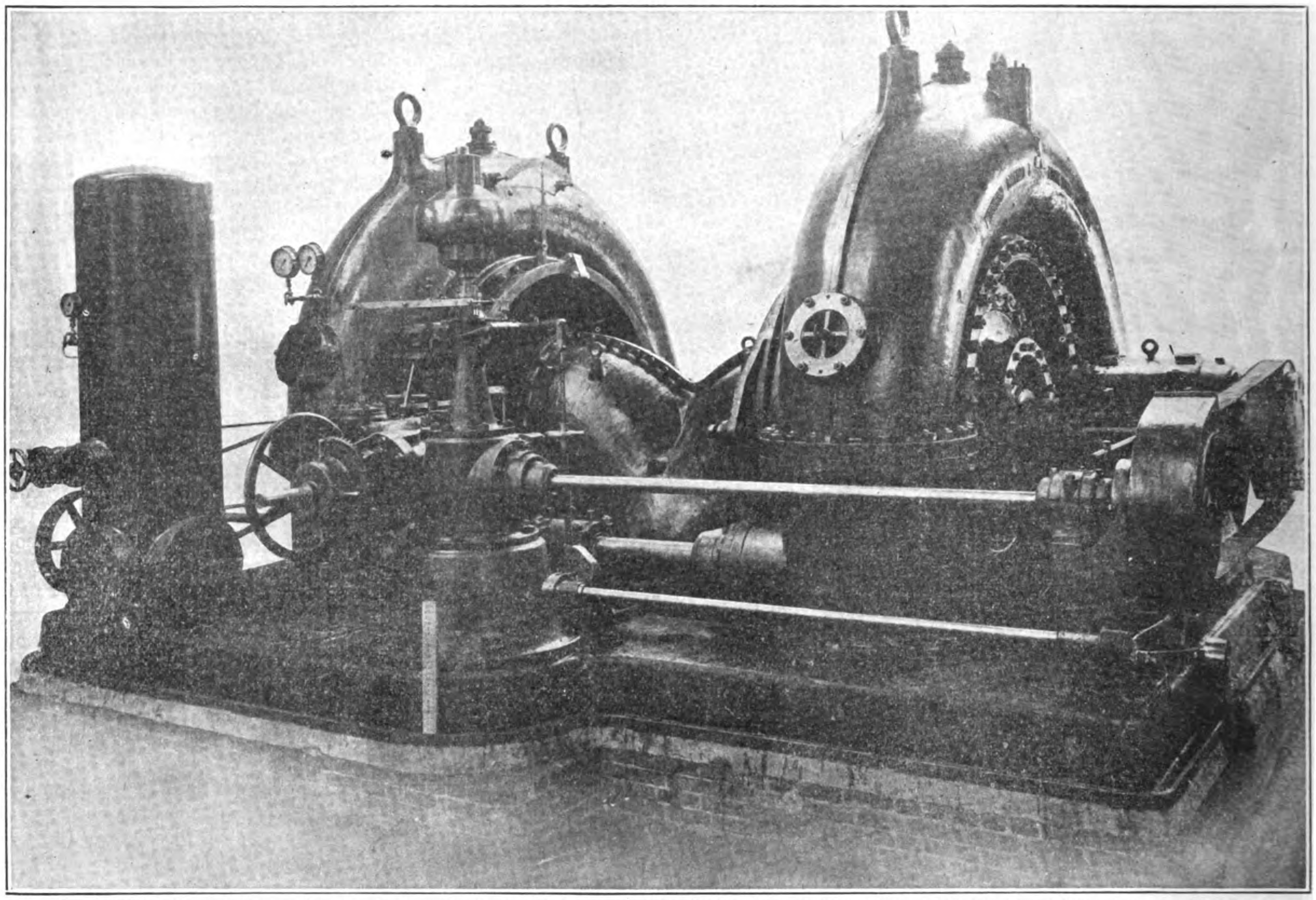
The Daido Denryoku and the Kansai operate very closely with the Tateyama Suiryoku, the Hakusan Denki and the Tenryugawa Suiryoku and as they are all operating in the central part of Japan, despite the fact that they are not included in one organization they are able to work to each other's advantage as if they were. The Ujigawa Denki is the only real competitor of this formidable line of the Daido Denki, and it is in the most advantageous position of all companies in the Kansai, Osaka district to supply power cheaply. It is closely related to the Nihon Denryoku, in which it has invested a greater part of the capital. The Nihon Denryoku is not such an ambitious project as the Daido, but it is closely allied with the Ujigawa, which might well be called its parent company. It is always improving its equipment, machinery, power plants, and transmission system, and it is expected that its new power station on the Takehara River will be completed some time this year. For some time it has been using the transmission lines belonging to the Ujigawa between Osaka and Ozaki, but when its new power plant is completed it will send 5,000 kilowatts of its own power over its own lines now being erected.

The Ujigawa Denki is naturally endeavoring to meet the threatened competition of the Daido Denki, and the relations which it has established with other companies recently have greatly increased its power. But compared to the powerful array of companies swallowed up by the ever-growing Daido last year, the Ujigawa is almost a negligible quantity in the power market, despite the excellence of its management. It generates 74,600 kilowatts to-day, only a little more than that of the Daido group, and when the new plans of the Daido are finally put into operation the Ujigawa's power supplies will be quite eclipsed. Defeated from the outset in the competitive race by number of alliances and power procurable, the Ujigawa Denki is expected to turn its attention to the quality of its service, endeavoring by the excellence of its equipment to meet competition with its more powerful rival. It is reported that the Ujigawa in pursuance of this idea will soon put all its lines underground, and it has already sent many experts abroad to study methods by which the company's equipment and service may be improved.

One of the latest power enterprises to be organized to operate in the central part of Japan is the Nohi Denryoku Kabushiki Kaisha, (Mino-Hida Electric Power Co., Ltd.), established in the spring of 1921. It operates in the provinces of Mino and Hida in Hokuroku district, under the jurisdiction of Gifu prefecture, and it owns many valuable power sites along the rivers in these two provinces. Its authorized capital is Y.3,000,000, and Y.750,000 has already been paid up. A power plant is now being constructed at the village of Neo on the No River, a branch of the Nagara River, 22 miles out of Gifu city. A 7,200-ft. long ditch is being excavated with a fall of 266-ft., which theoretically should generate

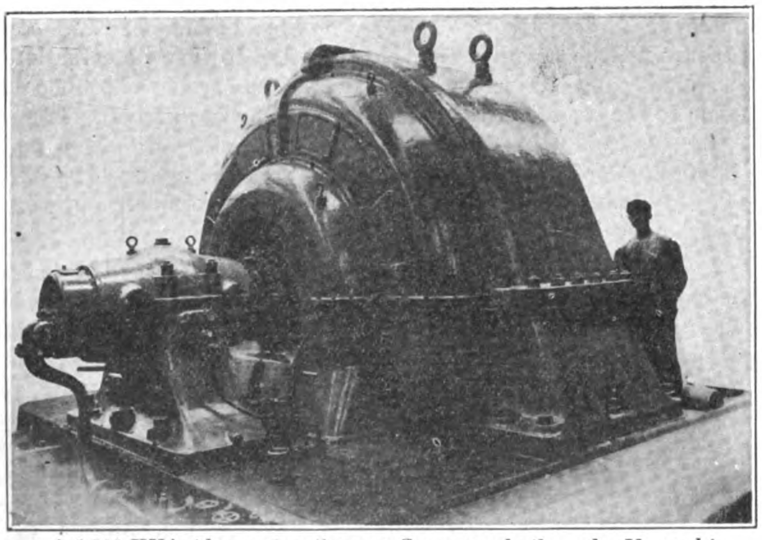
MITSUBISHI ELECTRICAL MACHINERY INSTALLED IN JAPAN

Made by the Mitsubishi Dockyard and Engineering Works at Nagasaki

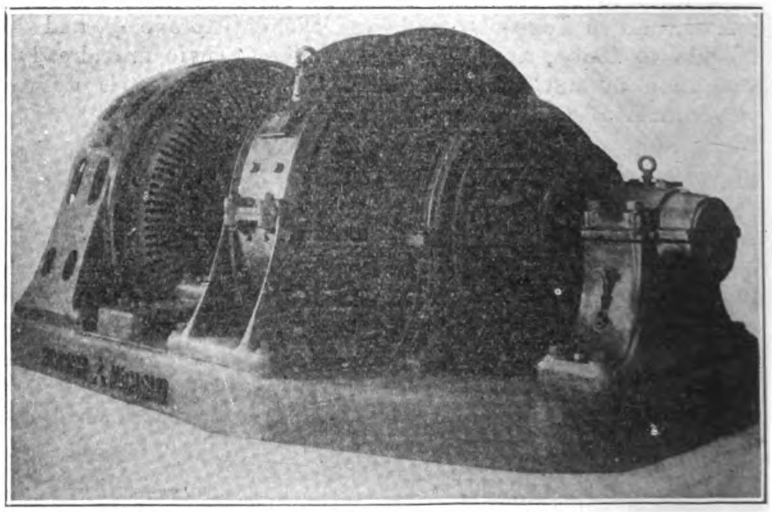


A 10,500 H.P. Francis Water Turbine built at the Kobe Works of the Mitsubishi Zosen Kaisha (Mitsubishi Dockyard & Engineering Works)

4,000 kilowatts. The estimate of construction costs was Y.1,700,-000, which brings the cost per kilowatt generated up to Y.560, estimating net production of power at 3,100 kilowatts. The usual estimate for construction to-day is Y.1,000 per kilowatt, so this is expected to be in a very fortunate position to supply power at very cheap rates, a much needed condition of affairs in the industrial world to-day. The promoters of this company are the directors of the Kansai Denki K.K., and although no power contracts have been entered into between them, it is reported that the Nohi will sell all its supply to the Kansai and its co-operating concerns at a price which guarantees 12 per cent. dividends on the Nohi's capital. The paid-up capital is not sufficient to build the power house planned. But as dividends of 12 per cent. must be paid to attract capital to shares, and debentures can be issued



A 5,700 KVA Alternating Current Generator built at the Nagasaki Works of the Mitsubishi Zosen Kaisha



A 1,000 Kilowatt Motor built at the Nagasaki Works of the Mitsubishi Zosen Kaisha

at 8 per cent., it is likely that the balance of the costs of construction will be covered by an issue of debentures.

Chugoku and Shikoku Districts

In these districts, Chugoku, south of Kobe along the Japan Sea, and the Inland Sea to Shimonoseki, and Shikoku, the island south of Kobe, there are very few rivers with swift currents. There is not one river in the whole district which will develop 100,000 kilowatts. So it is impossible to build large power stations. Demand for power too, is also very scattered, and is not concentrated in any one locality. Consequently the electric power projects are not located around any one city, such as is the case in the Tokyo and Osaka districts. This condition has acted as a deterrant to the amalgamation of existing companies on a very large scale, as it has acted against amalgamations in the Chubu and Hokuroku.

The Okayama Suiryoku Denki K.K. and the Susaki Denki K.K. were recently amalgamated under the name of the Chugoku Suiryoku Denki K.K. The Himeji Suiryoku bought up four small concerns in recent months, and the Hiroshima Dento and the Hiroshime-Kure Denryoku were also amalgamated under the name of the Hiroshima Denki K.K. Several other small companies with capital of less than Y.100,000 have also effected amalgamations of their interests. But all the big changes in company organizations have been centred around the towns, Himeji, Okayama, Hiroshima and Matsue.

In the Chugoku district the lines of water power supply are concentrated around (1) Himeji, drawing power from the Takakawa, the Ibigawa and the Chukusagawa, potentially generating 18,000 kilowatts; (2) Okayama drawing water from the Yoshigawa, Asahigawa and the Koryogawa, potentially capable of generating 30,000 kilowatts and (3) Hiroshima with potential supplies of 58,000 kilowatts developed from the Otagawa, Iwakunegawa and Osegawa.

The Sanin and Sanyo districts located along the Japan sea and near Shimonoseki on the Inland Sea, have very small water power resources. The city of Tottori on the Karogawa, has potential power of 23,000 kilowatts at its disposal, and Matsue can develop 42,000 kilowatts from the Hiigawa, Kanbegawa and the upper stream of the Gonogawa.

Shikoku

There is very little water power to be developed in Shikoku. In Tokushima prefecture there are 73,000 kilowatts to be developed on the upper stream of the Yoshinogawa, and in Kochi prefecture, 45,000 kilowatts can be obtained from the Niyodogawa.

To-day the most important companies operating in Shikoku are (1) Tokushima Suiryoku Denki in Tokushima city, capitalized at Y.6,000,000, developing 1,500 kilowatts from water, and 1,800 kilowatts from coal; (2) Shikoku Suiryoku, in Tadotsu city, capitalized at Y.5,030,000, developing 3,850 kilowatts from water and 1,500 from coal; (3) Iyo Denki Tetsudo (electric railway), capitalized at Y.4,600,000, generating 1,460 kilowatts from water and 1,000 kilowatts from coal; (4) Ehime Suiryoku in Imahara, capitalized at Y.10,000,000, generating 1,980 kilowatts from water power alone; (5) The Kochi prefecture water power electricity business office, in Kochi prefecture, capitalized at Y.1,245,000, developing 2,430 kilowatts from water. The total power generated from water is 12,220 kilowatts, and from coal 4,300 kilowatts.

The Tokushima Suiryoku recently increased its generating plant equipment in Sakura by 2,000 kilowatts, and on the Jinzagawa by 600 kilowatts, and on the Igagawa by 6,000 kilowatts, and its coal power station in Komatsu by 1,000 kilowatts, a total of 9,400 kilowatts in all. At Naruto Straits, the cable station supplied power to the Awaji-Sumoto mills of the Kanegafuchi Cotton Spinning Mills.

Kyushu

Kyushu is one of the centres of the coal mining industry in Japan and the water power resources of that island have not yet been extensively developed.

The more important companies in Kyushu are: (1) Kyushu Suiryoku Denki, in Fukuoka city, generating 59,902 kilowatts from water and 14,865 kilowatts from coal. It has under construction an extension of its water power plant amounting to 15,000 kilowatts; (2) Kyushu Dento Tetsudo (electric light and railway) in Fukuoka city, generating 10,600 kilowatts from water and 30,065 kilowatts from coal; (3) The Kumamoto Denki, in Kumamoto, generating 18,800 kilowatts from water power; (4) The Denki Kogyo Gasu in Kagoshima, generating 1,000 kilowatts from water and 1,760 kilowatts from coal; (5) Nihon Sanso Hiryo (fertilizer company) in Oita generating 29,815 kilowatts from water. All these companies own many valuable power sites not yet developed.

The more important coal mining companies of Kyushu all have their own power plants to use for their own operations, but the Sumitomo, Mitsui and Mitsuibishi interests supply power from their stations to the surrounding districts.

The rivers of Kyushu are capable of developing the following powers :—

Chikugogawa ...	29 sites,	132,442	kilowatts
Oitagawa	12 ,,	34,614	,,
Onogawa	10 ,,	39,789	,,
Shiratsuwagawa ...	4 ,,	48,790	,,
Midorigawa	14 ,,	61,306	,,
Oyodogawa	22 ,,	55,595	,,
Gokasegawa	16 ,,	43,401	,,
Sendaigawa	10 ,,	3,911	,,

The principal distributors are the Kyushi Suiryoku, and the Kyushu Denki Tetsudo, which at the suggestion of the imperial railway department are planning to unite their interests.

The Kyushu Dento Tetsudo, Kyushu Suiryoku Denki, Kyushu Denki Kido, and the Kumamoto Denki are planning a big amalgamation under the name of the Kyushu Soden K.K. (Kyushu General Eelectric Co.) It is planned to develop the potential power of Miyazaki prefecture in south-eastern Kyushu, and to transmit power to the industrial district around Moji. But there are many difficulties in the way of successful operation in Miyazaki prefecture, particularly because the laws of the prefecture permit the authorities to levy a tax on power generated in the prefecture when it is sent to other districts.

Hokkaido

The most important power resources of the Hokkaido are :—

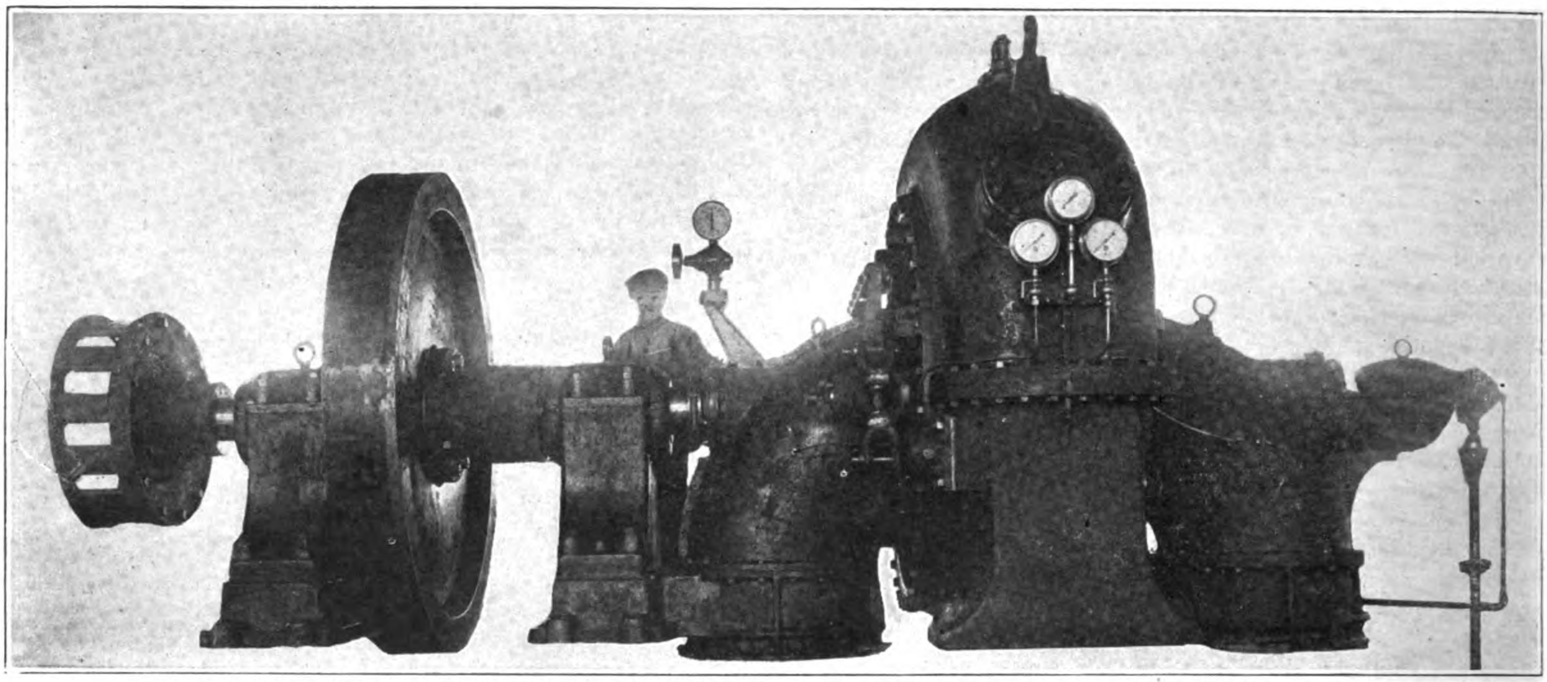
Ishigarigawa	144,000	kilowatts
Shiribeshigawa...	27,000	,,
Togachigawa	96,000	,,
Kushirogawa	30,000	,,

All these are in the northern part of the island, where there is but little development of population and industry. Even in the south there is little demand for power. In the southern part of the island the Oushi and Nagara rivers have considerable potential power. In the neighborhood of Hakodate the Hakodate Suiden develops power from the Oritogawa, and the Shiribeshi Denki develops power on the Shiribeshigawa, and a branch of the Ishigarigawa. There are many small companies all over the Hokkaido, the Fuji Denki, Sapporo Suiryoku and Oji Seishi, the Nitsui Kozan, etc., but no amalgamation of interests so scattered has been made. Other mines and industrial companies have their own power stations, and the only company making any attempt at concentrating power interests is the Teikoku Dento which finds in the Hokkaido one of the most prosperous districts of its operations.

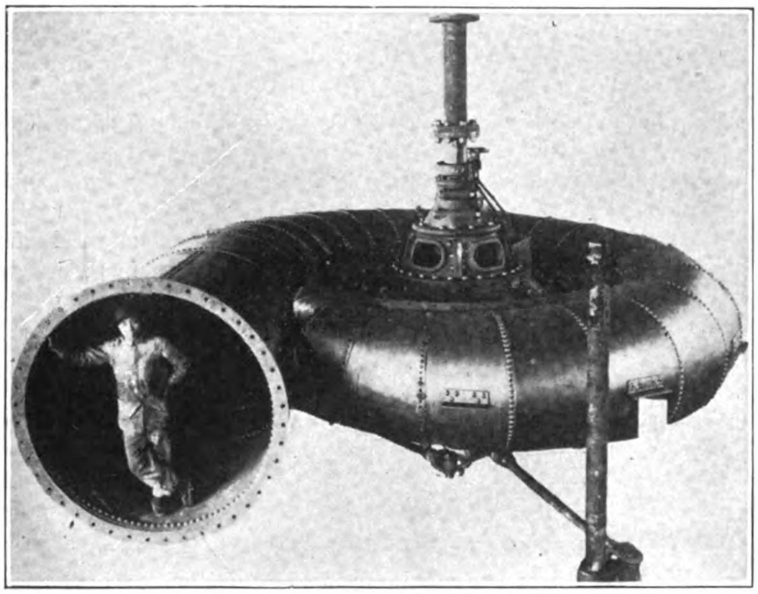
Hydro-Electric Power in Kyushu

During the period of war prosperity there was a great increase in the number of factories established in Kyushu. To furnish the power for many of these factories great strides were made in developing water power resources in that island. At the end of 1914 there were only 101,061 kilowatts developed by hydro-electric, coal and gas plants. According to an investigation of the depart-

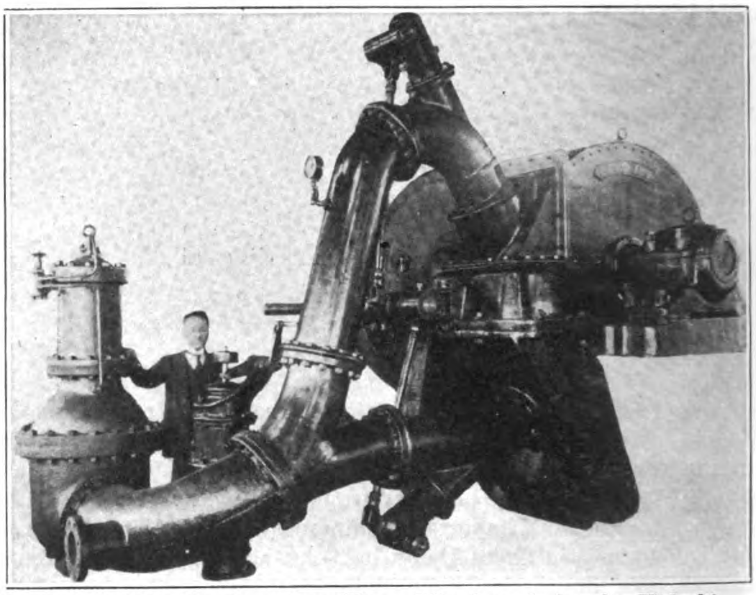
HYDRO-ELECTRICAL EQUIPMENT MANUFACTURED BY THE HIDACHI ENGINEERING WORKS LOCATED AT SUKEGAWA, IBARAKI PREFECTURE, JAPAN



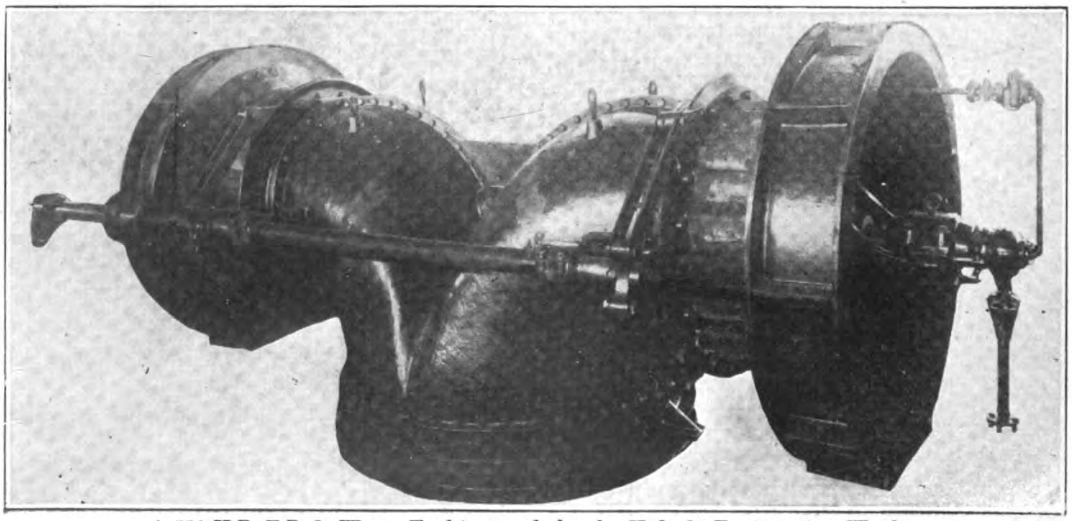
A 2,400 F.D.S. Water Turbine Manufactured by the Hidachi Engineering Works for the Sanyo Hydro-Electric Company



A 1,500 H.P. V.F.S.S. Water Turbine built by the Hidachi Engineering Works for the Shidzuoka Hydro-Electric Company



A 2,400 H.P. Nozzle Pelton Water Wheel made by the Hidachi Engineering Works for the Sanyo Hydro-Electric Company



A 750 H.P. F.D.O. Water Turbine made by the Hidachi Engineering Works for the Mannose Hydro-Electric Company

ment of communications, these three sources of power by April 1920 had developed 465,147 kilowatts. Of this amount 234,584 kilowatts were developed from water power plants, 207,774 kilowatts from coal, and 2,789 kilowatts from gas burning plants.

Between April 1, 1920, and March 31, 1921, a tremenduous increase to O.K. place in the amount of capital invested in electric power plants in Kyushu. On March 31, 1921, the authorized capital of all projects in Kyushu was Y.153,380,000, of which Y.94,250,000 was paid up. This represented an increase af Y.51,590,000 in nominal capital, and of Y.25,980,000 in paid-up capital since April 1, 1920.

One of the conspicuous features of the electric power industry in Kyushu during the period April 1, 1920-March 31, 1921, was the great decrease in the demand for power from the users of large quantities, and the very marked increase, on the contrary, of the number of small users. The almost total suspension of business by many chemical companies and mining concerns so prosperous during the war caused this decrease in demand for large quantities. On March 31, 1920, there were 6,410 electric motors used by 6,612 concerns, consuming 175,000 kilowatts, but at the end of March, 1921, there were 8,538 motors, used by 7,027 concerns, consuming only 109,524 kilowatts. This decrease is entirely due to the closing of many large factories because of the difficulties of continued financing. Even blacksmiths and carpenter shops have entered the ranks of users of small amounts of power, and there is no doubt whatever that this change in the class of users is a healthy sign of the return of peace conditions, and a modernization of the ideas of small machine shop owners.

Four companies control the most important hydro-electric power of Kyushu, the Kyushu Denki Kido Kaisha, Kyushu Dento Tetsudo Kaisha Kyushu Suiryoku Kaisha, and the Kumamoto Denki Kaisha. These four companies also have controlling interests in all the other electric companies of Kyushu.

While the use of electric power by manufacturing concerns has decreased, there has been a steady increase in the use of power for lighting. At the end of March, 1920, one house in Kyushu burned 2.3 lights of 16 c.p. each, from sunset to sunrise. By the end of March, 1921, this had increased to 4.48 lights. The use of electric lights has little appreciable connection with financial conditions, for their use is a development of the blessings of peace. The use of electric power in factories, is, however, in quite a contrary position, being utterly dependent on the financial condition of the country.

The average cost of burning one 16-candle power light from sunset to sunrise for one month in Kyushu is Y.1.057. The meter charge per kilowatt is 20.2 sen. The Osaka Dento Kaisha charges Y.0.555 for the same light, 16 c.p. and the same service. There is a reason for this in the greater cost of equipment in Kyushu, where one pole carries only two or three lights, while the Osaka equipment carries more than 100.

Power contracts are usually individual, so it is very difficult to arrive at the actual cost of electric power in Japan.

There has been a great growth in the amount of power generated by hydro-electric power plants since 1920. But in 1921 power from hydro-electric plants was more expensive than power from coal and gas-burning plants. The price of coal was low in 1921, and it had a very bad effect on the water power companies in Kyushu. If coal remains at its present low price the future development of the hydro-electric power business in Kyushu will be greatly threatened. Not only in Kyushu is the industry threatened, but in other parts of Japan as well. In the Osaka district the price of coal fell to 70 yen per 10,000 *kin* (13,333-lb., 3 6 2/3 tons of 2,000-lb.) If it falls lower than this hydro-electric plants can no longer supply power at cheaper rates than coal burning plants. Just now the price of coal is falling below 70 yen, and the hydro-electric interests are not at all unreasonably concerned about the future of their business. To protect themselves in all emergencies the four Kyushu companies already mentioned are planning to combine their interests.

The background of the Kyushu electric world is composed of Baron Kichiyemon Sumitomo, Mr. Wada Toyoji, and Mr. Momosuke Fukazawa. These three men are planning the organization of the Kyushu Soden Kaisha (The Kyushu General Electric Co., Ltd.), with a capital of Y.30,000,000, which they will later increase to Y.200,000,000. It plans to exploit the unworked resources of Miyazaki prefecture in the south-east of Kyushu.

Miyazaki prefecture possesses most of the undeveloped water power resources of Kyushu. Many proposals have been made from time to time to utilize these resources, but the inhabitants have always violently opposed any exploitation of the prefecture's power unless it is used entirely within the prefecture. This is nonsense, but the people complain that if the power is monopolized by a company like the Kyushu Soden Kaisha, they will be charged anything the company pleases for the power they will use. But actually the Kyushu Soden would serve to smooth out the inequalities in the present service. Power could be switched from one locality to another as plants are laid off because of low water supply, and when necessary power could be turned on from coal-burning plants. The cost of new lines would be greatly economized, and it is now reported that despite the protests of the people of the prefecture, the company will be organized, and that it will eventually exploit the resources of Miyazaki prefecture's streams.

It has been estimated that it will cost Y 550 to develop one kilowatt in Miyazaki prefecture. It is 180 miles from Miyazaki to north Kyushu where most of the power will be used. To send power 180 miles is rather an expensive proceeding, so that altogether the cost of power from Miyazaki prefecture will not be very cheap. The capital of Y.30,000,000 planned for the new General Electric Company of Kyushu, is not sufficient to meet all the demands the construction will make on it, so it will probably be necessary to increase this capital to Y.200,000,000 before actual work is commenced.

The Kyushu Electric Light and Railway Company, which supplies Nagasaki with electric light and power will shortly enter into a contract of amalgamation with the Kansai Electric Company of Nagoya. The capital of the Kyushu company is Y.50,000,000 of which Y.24,312,500 is paid-up. The Kansai company is capitalized at Y.73,389,000, of which Y.52,783,441 is paid-up. The capital of the new company which is to absorb these two companies will be Y.121,989,600.

The Kyushu company obtains most of its power from coal plants, and the Kansai from water power. The Kyushu company needs funds to build hydro-electric stations in Miyazaki prefecture, and an electric tramline between Omuta and Fukuoka, which will require Y.20,000,000 at least. The Kansai company wishes to obtain the services of the Kyushu company's directorate, and as the two companies are capitalized by the same individuals the amalgamation was more or less a matter of course.

The Teikoku Dento Kabushiki Kaisha

(The Imperial Electric Light Co., Ltd.)

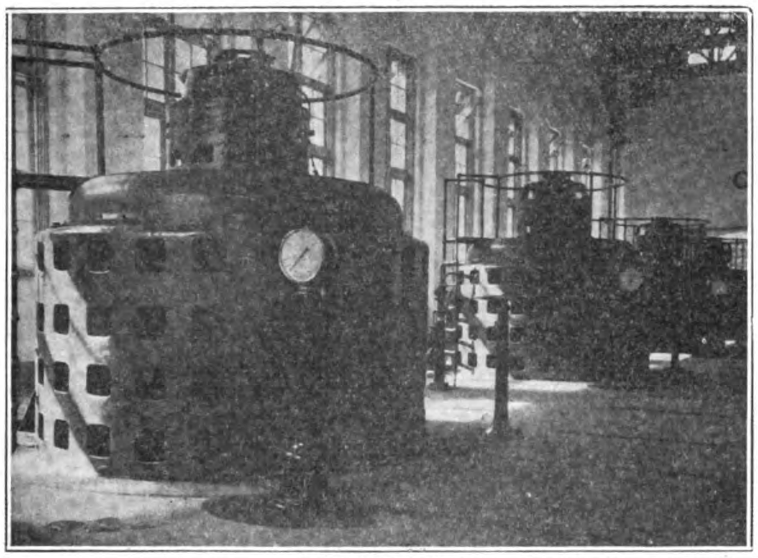
A Typical Example of Electric Lighting Expansion

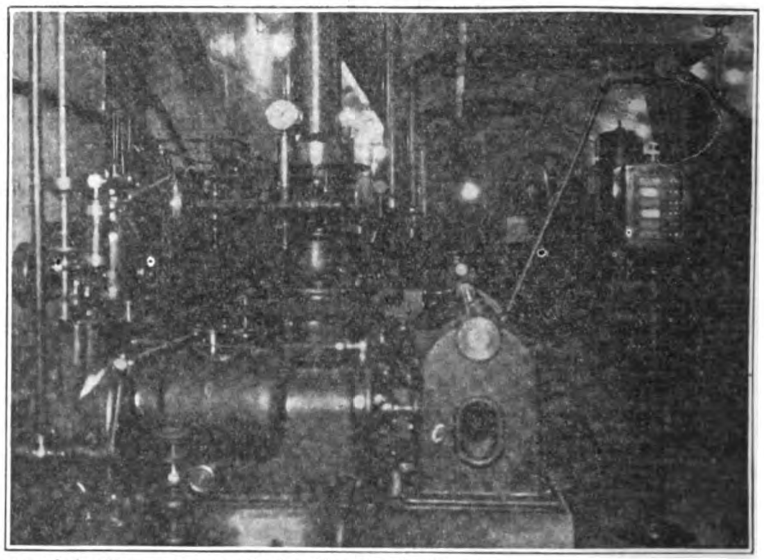
One of the most important movements in Japanese industry and finance is the absorption of small water power companies by larger concerns, affecting a concentration of power facilities in the important industrial districts.

The Teikoku Dento K.K., however, is the only concern of its kind specializing in concentrating electric light companies under its control. It is ten years since it was first organized with the object of investing in sound electric light projects in country districts. During the years of its operations its methods of business have undergone constant change, and its policy of expansion in all profitable directions has eventuated in a scheme of concentration of lighting facilities through amalgamation with small companies operating in and about its special territories.

In its beginnings there were no particularly well defined plans formulated for concentration, but as the demand for electric light continually expanded well defined lines along which a concentration

SWISS TURBINES IN JAPAN FROM THE WORKS OF ESCHER, WYSS & COMPANY





4-9,600 H.P. Turbines installed in the Power House of the Katsuragawa Hydro-Electric Company

of operating interests could profitably be undertaken were developed. The Teikoku Dento was a pioneer, if not the only enterprise, in the field of electric light expansion in the less densely populated districts. The company operates from three centres, controlling, or owning outright, groups of companies supplying the geographical districts covered from these centres: (1) Vicinity of Tokyo, country districts (The Kwanto); (2) Tantan District, north of Kyoto; (3) Hokkaido.

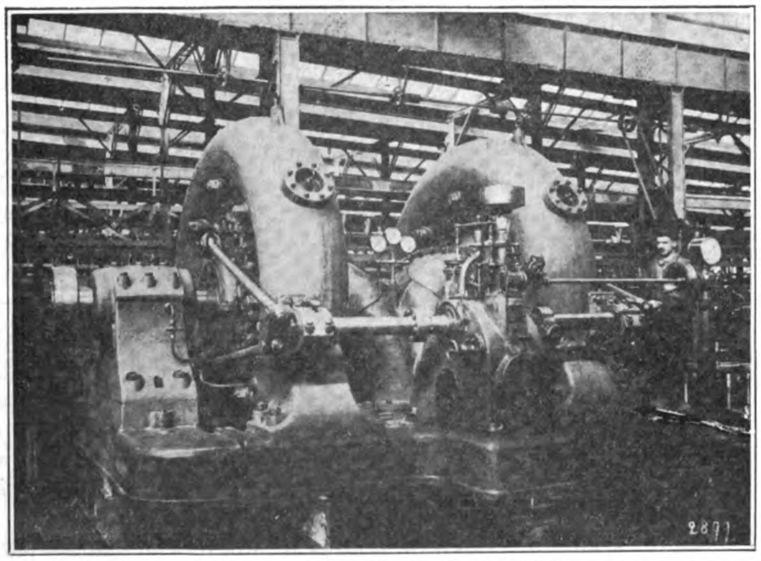
The greatest strength of the company is concentrated around Tokyo, where it has recently been strengthened by absorbing the Shimotsuke Denryoku Kabushiki Kaisha (Shimotsuke Electric Power Co., Ltd.), referred to in detail further on. Following this amalgamation, the Teikoku Dento completely reorganized its business and as a consequence it has now become a new and forceful factor in the electric power field in the Kwanto district (eastern Japan with Tokyo as the centre).

On October 1, 1921, the Teikoku Dento annexed the Santan Denki Kaisha capitalized at Y.5,000,000 and doing business at Toyooka Machi, in Hyogo prefecture. The Santan paid a dividend of 10 per cent. in September 1921, but owing to lack of capital it was found difficult to develop its business to keep in touch with the growth of the district in which it operates. The Teikoku at once took advantage of this opportunity to get into the Osaka-Kobe territory.

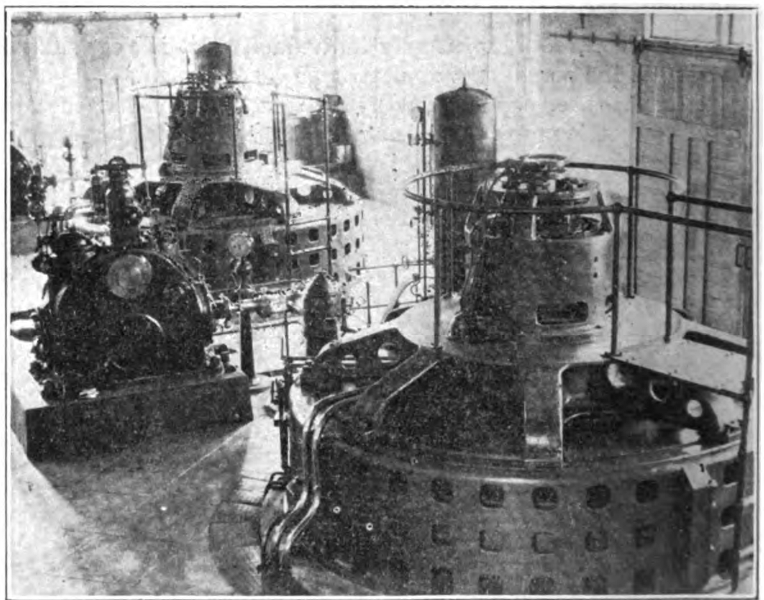
The development of the Teikoku Dento has steadily followed along the line of amalgamation with small lighting companies, especially in the second half of 1917, and even after the panic of 1920 no adverse effects are seen in the company's reports, as indicated in the following table :—

Half Year		Paid-up Capital Yen	Net Profits Yen	Dividends Yen	Rate of Dividend Per cent.
1915, 1st	..	880,000	45,111	35,200	8
2nd	..	1,000,000	53,589	42,000	8½
1916, 1st	..	1,000,000	64,656	50,000	10
2nd	..	1,000,000	77,402	55,000	10
1917, 1st	..	1,000,000	84,967	60,000	12
2nd	..	1,704,000	137,749	102,270	12
1918, 1st	..	1,775,000	151,410	106,500	12
2nd	..	2,830,000	314,922	169,800	12
1919, 1st	..	2,830,000	350,308	169,800	12
2nd	..	2,830,000	372,351	169,800	12
1920, 1st	..	5,175,400	567,880	310,525	12
2nd	..	6,489,200	724,951	389,525	12

Unfortunately, when the old company was dissolved early in 1921, no report was issued, and it has been impossible to include the first term of business in 1921 in this table. On March 1, 1922, this company called up the outstanding Y.1,840,000 unpaid capital,

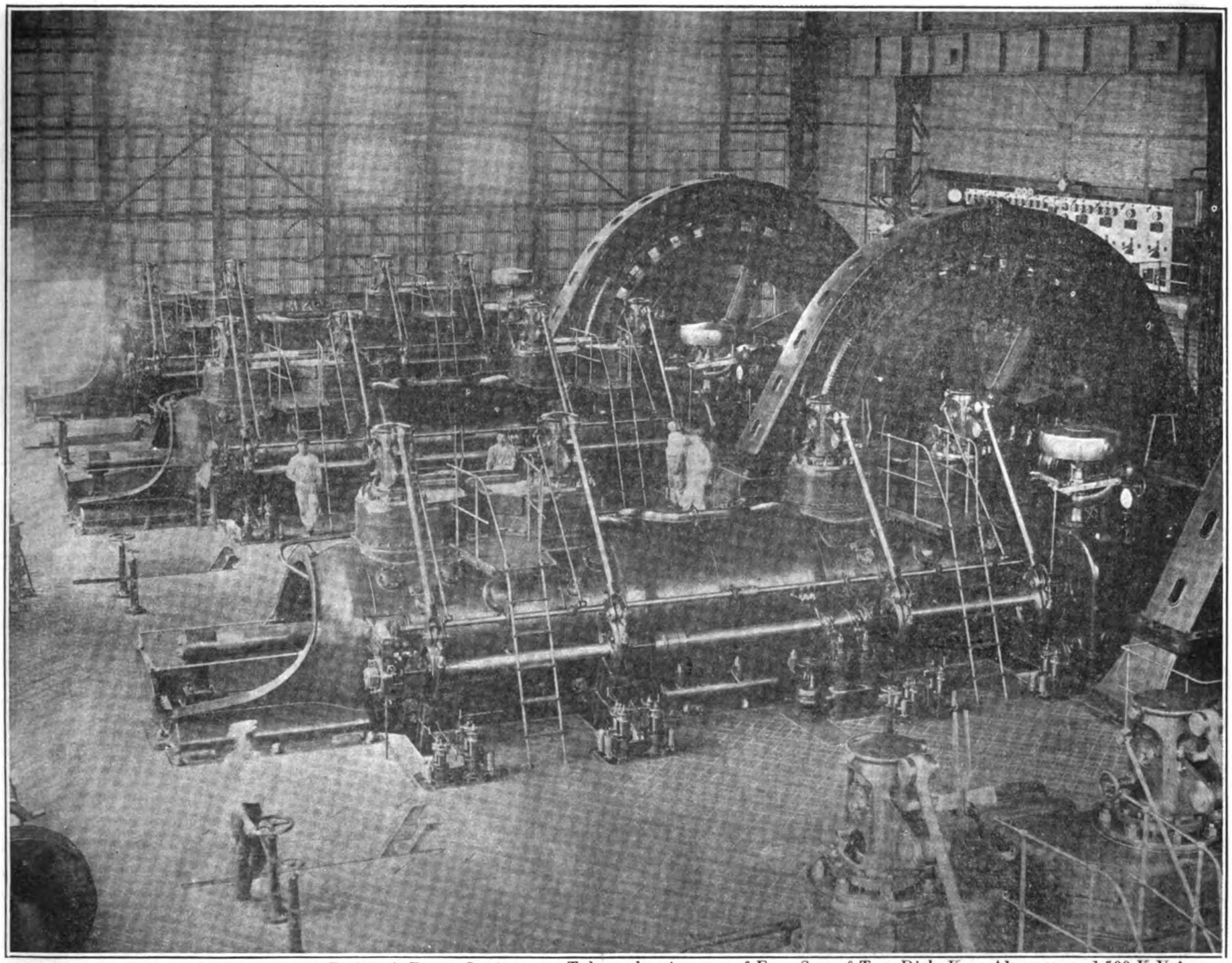


Six 12,500 H.P. Escher, Wyss Turbines installed in the Power House of the Tokyo Dento Company

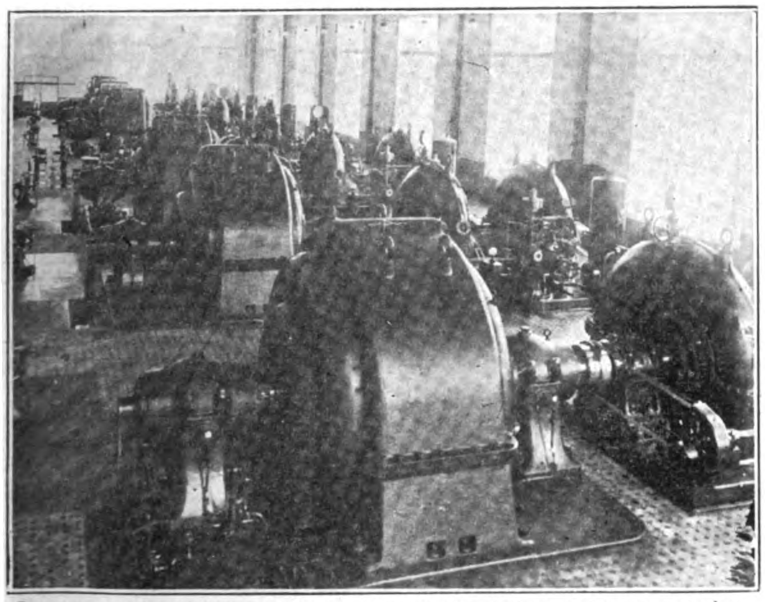


Two 2,750 H.P. Escher, Wyss Turbines operating in the Kyoto Dento Power Station

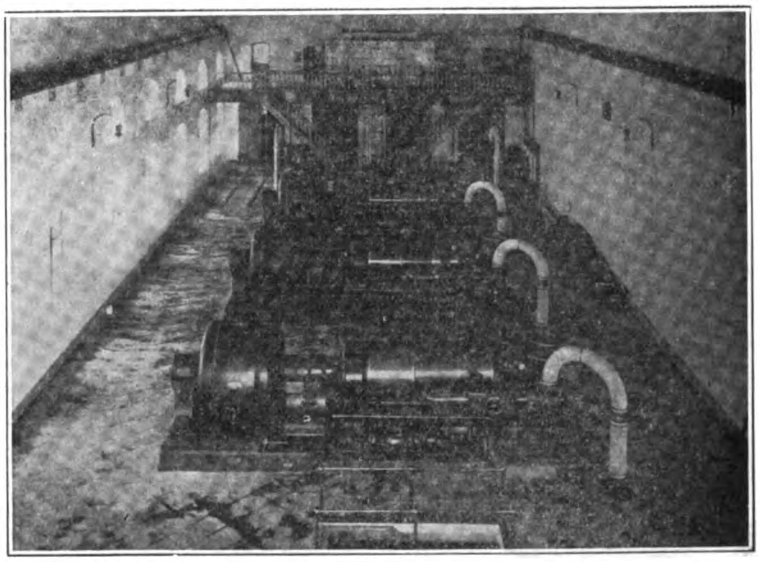
ENGLISH ELECTRIC COMPANY (DICK KERR) INSTALLATION IN JAPAN



Interior of Imperial Government Railway's Power Station near Tokyo, showing one of Four Sets of Two Dick Kerr Alternators, 1,500 K.V.A. each, 3 phase, 25 cycles, 11,000 volts, 94 rpm, driven by Lilleshall Gas Engines

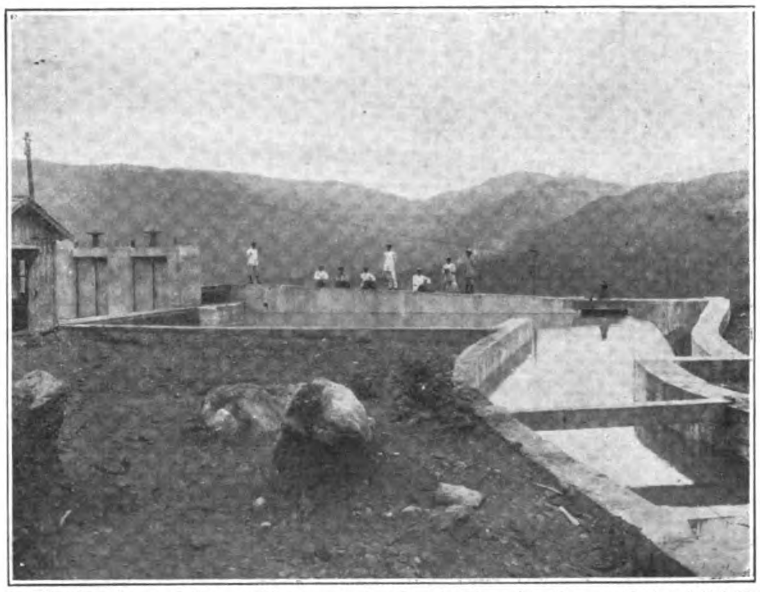


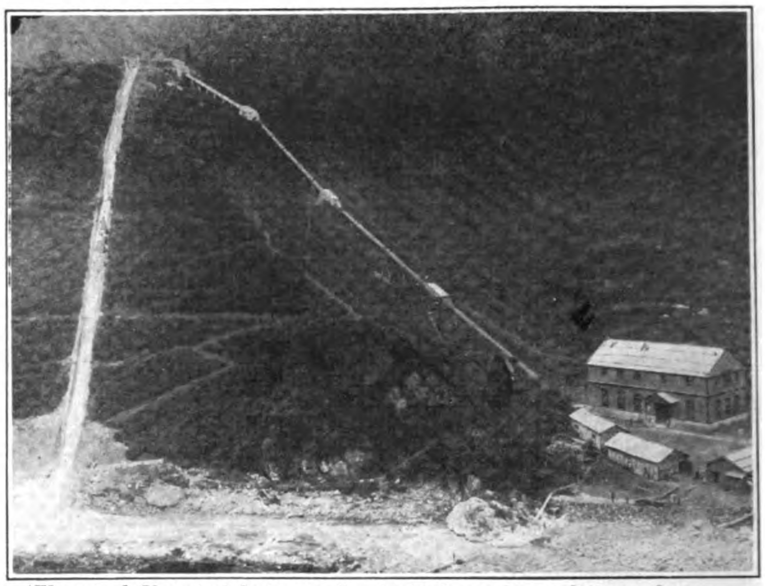
Interior of the Inawashiro Hydro-Electric No. 1 Power House at Fukushima-ken, showing 6 Dick Kerr Alternators of 7,775 K.V.A. each, 3 phase, 30 cycles, 6,600 volts, 375 rmp, driven by Escher, Wyss Turbines



Interior of the Keihan Electric Railway Power Station at Osaka, showing 3 Dick Kerr Alternators, each 850 K.V.A., 3 phase, 25 cycles, 2,300 volts, 1,500 rmp.

A MODEL WESTINGHOUSE INSTALLATION IN JAPAN





The Intake and Power House of the Denki Kagaku Kogyo Kabushiki Kaisha (Electrical Chemical Industry Co., Ltd.) located near Niigata, Japan

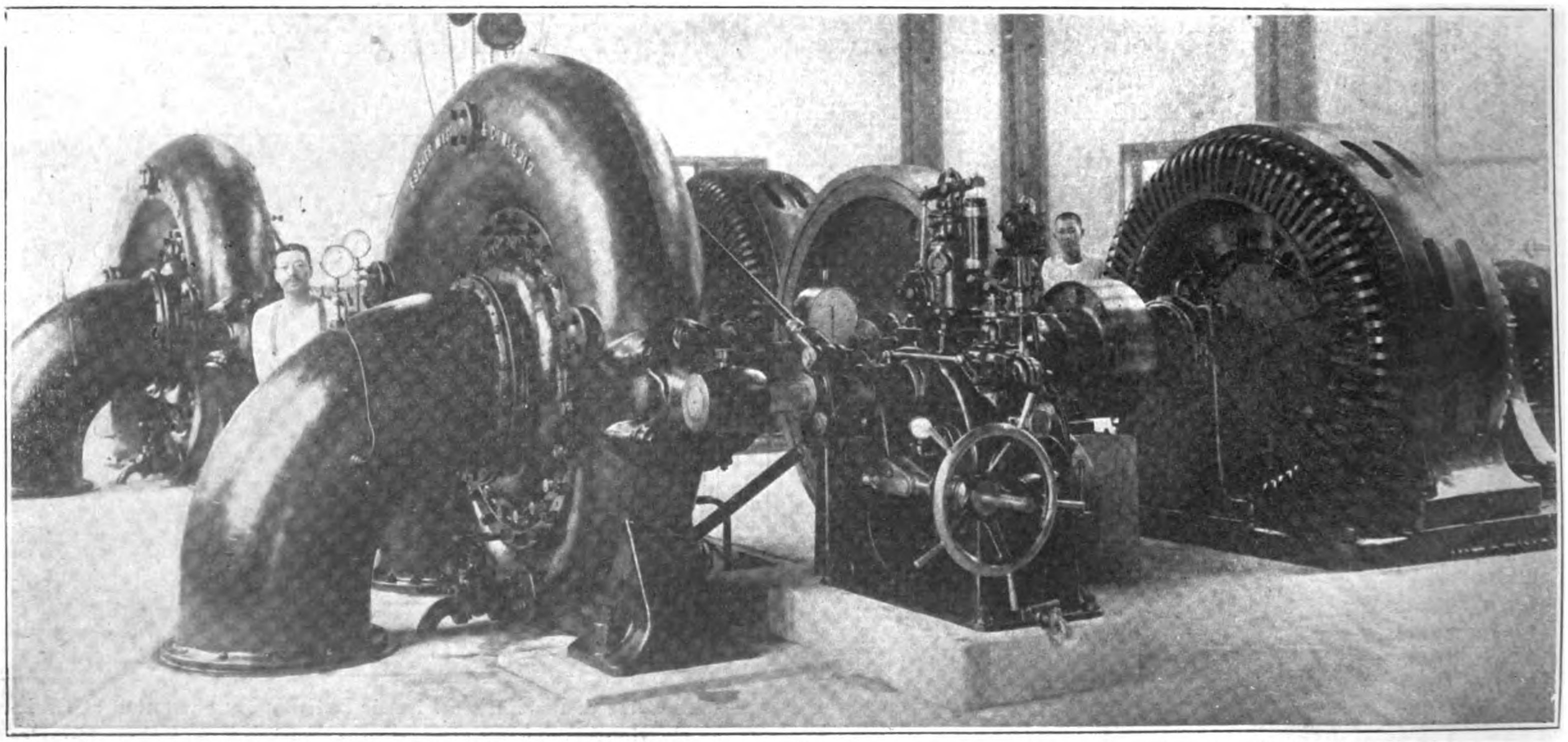
which brings the total up to its authorized amount of Y.24,645,000, fully paid-up.

Recently the department of communications licensed the amalgamation of the Teikoku Dento with the Saitama Dento K.K. and the Santan Denki K.K., and in order to purchase these concerns the company's capital was increased to Y.33,252,000. These two amalgamations extend its influence further afield.

From 1921, the business of this company enjoyed a remarkable expansion. During the year the number of lights supplied increased 250,000, and it is now planned to increase the service to supply 1,000,000 lights in all. In order to carry out this plan it is necessary to build a new power plant on the Kinugawa which will develop 2,100 kilowatts, and another 2,000 kilowatts, steam generating plant will be built at Miatsu in Tango province.

Plans are also afoot to effect an amalgamation with the Yuragawa Suiryoku Denki K.K., generating 2,000 kilowatts. If this is carried out the capital of the Teikoku Dento must be increased to Y.50,000,000. This increase was authorized at the last general meeting of the shareholders of the company, and it was decided to issue Y.16,000,000 of new shares at the end of May, 1922, to be allotted to old shareholders on the basis of one new one to two old shares. The issue will in all probability not be floated easily as it is now difficult to sell stocks unless 12 per cent. dividends are visible.

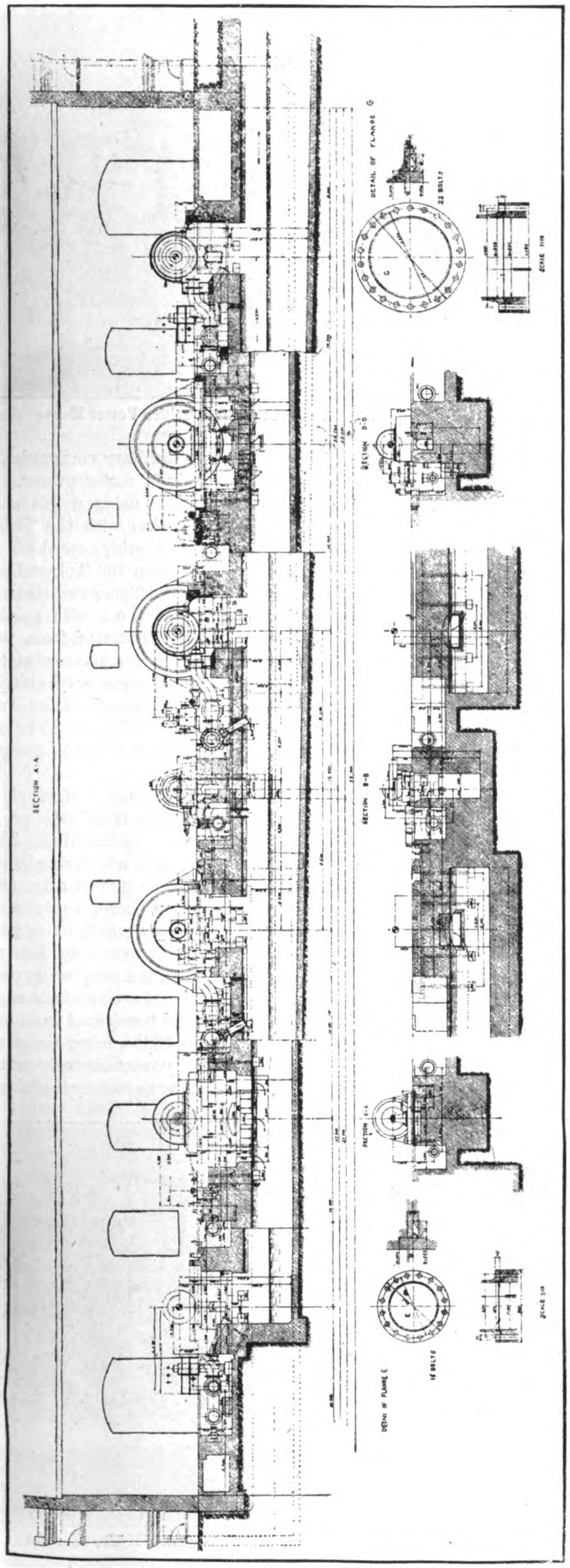
It is also part of the plan of the Teikoku Dento, to annex the Musashi Suiden, capitalized at Y.6,400,000, of which Y.4,600,000 is paid up. It has a water power station at Kawagoe in Saitama prefecture generating 4,000 kilowatts, and an 800-kilowatt steam generating plant. Another station is now being constructed to produce 2,000 kilowatts. The Musashi Suiden supplies 120,000 lights and sells power amounting to about 3,000 h.p. The generating stations are only about eight miles from Omiya, north of Tokyo, and between the two towns the company operates an electric railway, which the Teikoku Dento will not take over.



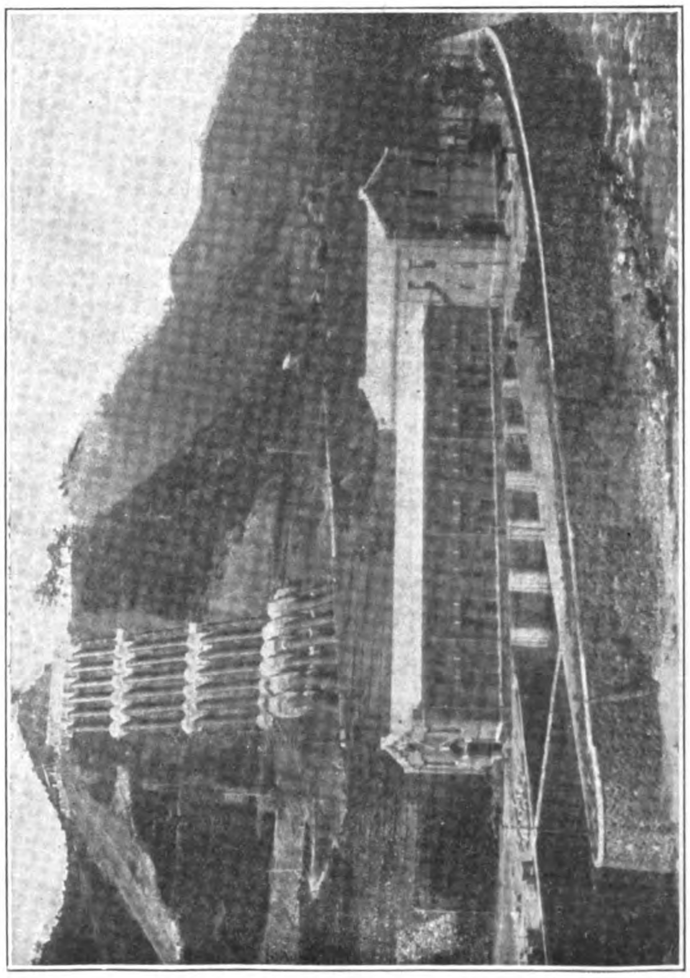
Interior View of the Power House of the Electric Chemical Company at Niigata, showing two 2,500 K.V.A., 50 cycles, 3,300 volt Westinghouse Generators, driven by Escher, Wyss Turbines

PLAN OF THE KATSURAGAWA HYDRO-ELECTRIC POWER STATION

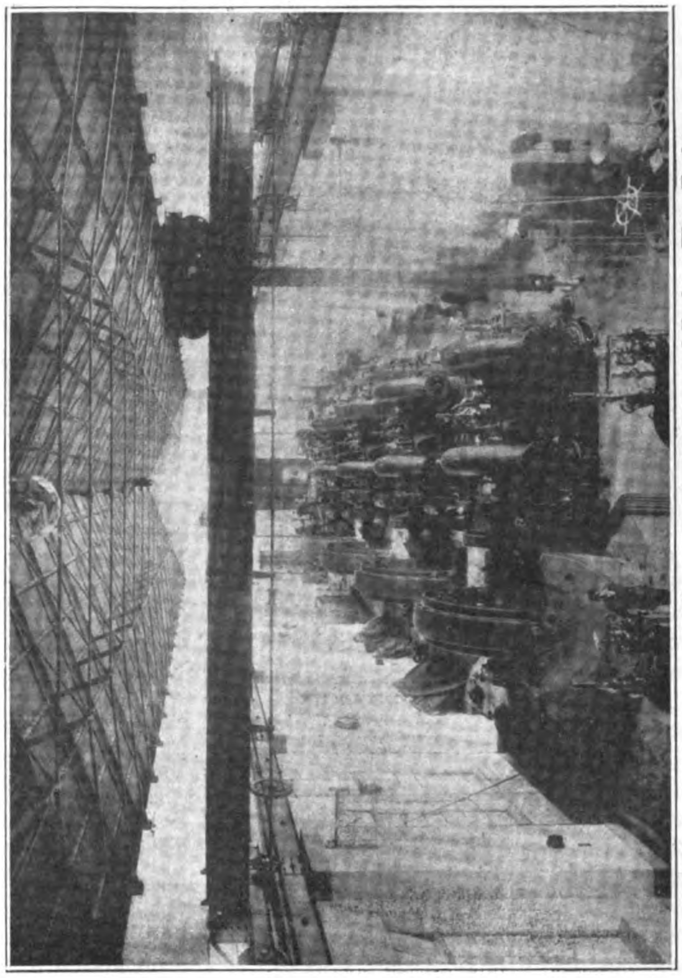
Escher, Wyss Turbines and A.E.G. Generators



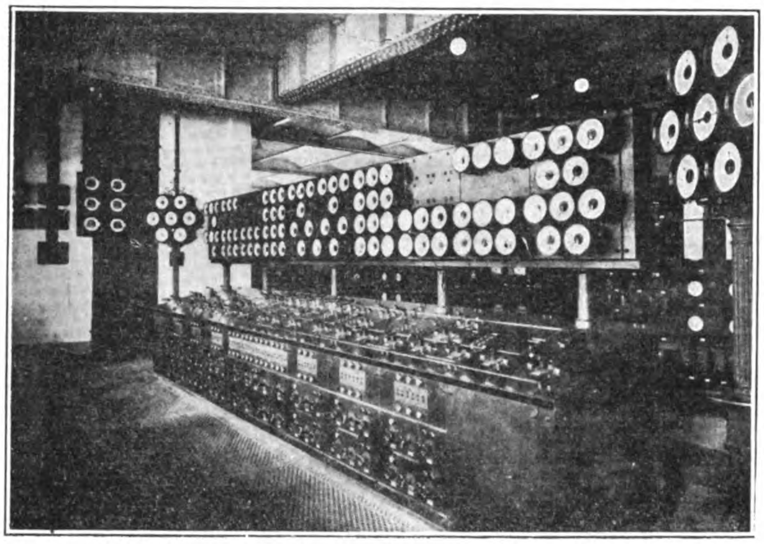
THE KOMA POWER STATION OF THE TOKYO ELECTRIC COMPANY



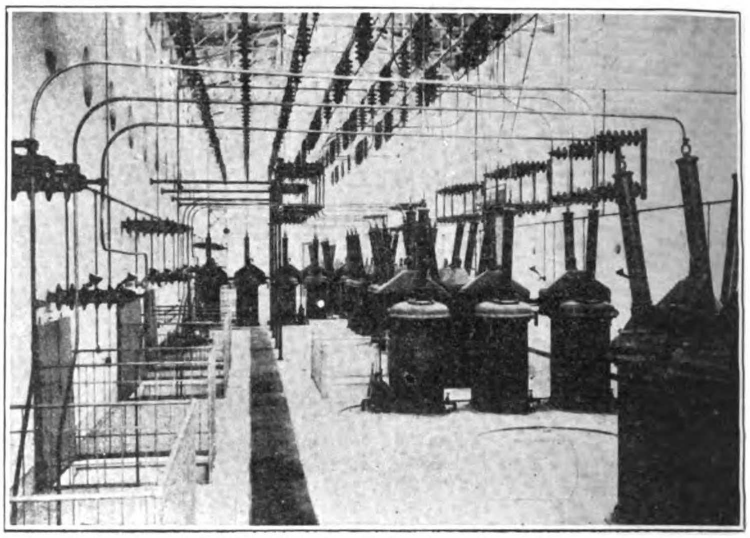
The Power House



Interior View: Siemens Schuchardt Generators and Escher, Wyss Turbines



Main Control Board at the Inawashiro Power House



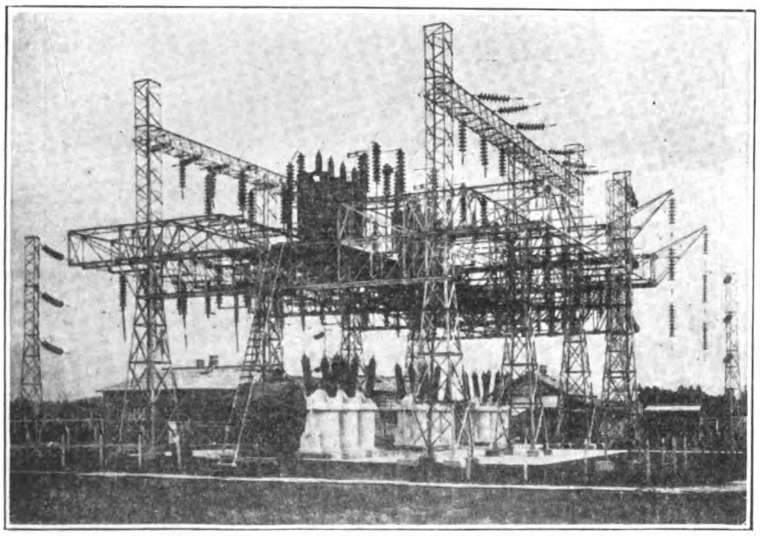
High-tension Switch Room at the Inawashiro Power House

Profits of the Teikoku Dento at the end of March, 1922, are estimated at Y.1,550,000, and a dividend of 10 per cent., 1 per cent. more than at the end of September, 1921, will probably be paid.

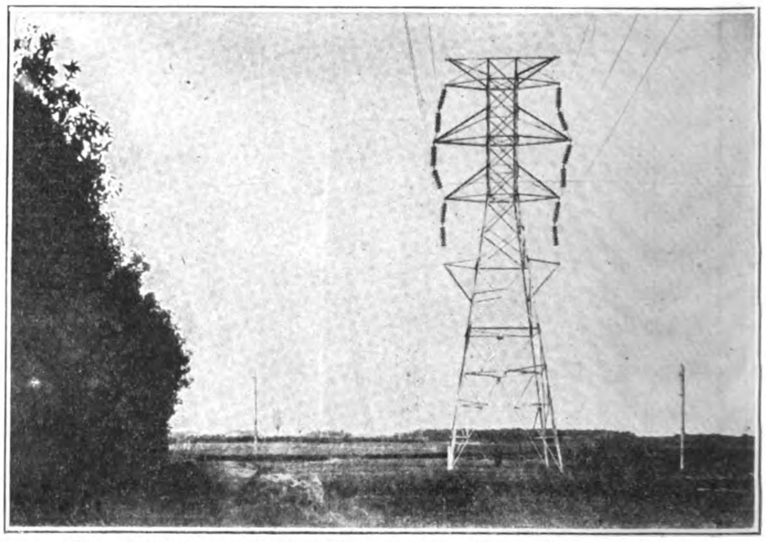
In 1917, control of lighting companies in Chiba practically passed into the hands of the Teikoku Dento. Early in 1918, a new field of operations was entered when the Otaru Denki K.K. and the Hokkaido Denki K.K. were bought out, and operated under the name of the Hokkaido Branch of the Teikoku Dento. By the beginning of 1920, this company had under its direct control 22 electric light companies. It also owned the Teikoku Seiyu K.K. (Imperial Oil Mfg. Co., Ltd.) The greatest advance in the history of the company, however, was made in 1921 when the old company with all its subsidiaries was dissolved on March 31, and reorganized on April 1, 1921, as the new Teikoku Dento K.K. The reorganized company included the Sotobo Dento K.K., the Toyokuni Dento K.K., and on April 16, the Shimotsuke Denryoku K.K. was annexed. This series of important amalgamations at once placed the Teikoku Dento in the front rank of Japanese electric light companies. The company's success has been conspicuous in some districts while in others its failure has been pronounced. However, the fact that expansion has been regular is shown in the foregoing table. Comparing business for the second half of 1921 with that of the first half of 1914, the number of lights increased 20.6 times.

Originally, most of the company's power was purchased from other power supply concerns. What little power it produced itself was generated by gas engines. However, since the annexation of the Shimotsuke Denryoku many changes have been made in contracts for power. Their gas engine generators have been abandoned at most stations. Several of the earlier subsidiary companies, the Katsuura Dento, for instance, generate from water power. The Miura station, south of Yokohama had been using a gas engine to generate power, but since its amalgamation with the Teikoku Dento it bought power from the Yokohama Denki, now the Tokyo Dento. The Seibu station receives power from the Tokyo Dento, and the Sakura and Hishigawa offices from the Tonegawa Hatsuden Sho, now also Tokyo Dento. In the west, the centre north of Kyoto, the Tajima station generates 500, kilowatts from water power, a part of which is supplied to the Fukuchiyama station. The Oyeyama station has its own hydro-electric generator. In the Hokkaido 1,500 kilowatts are purchased from the Oji Paper Company, and 300 kilowatts from the Shiribeshi Denki. The company owns a generating plant of its own at the Iwauchi Suiryoku K.K.

The district north of Kyoto is practically self-supplying. The Hokkaido district gets its principal supply from others. But the Tokyo district lacked water power, especially in Chiba. There is no main line for power transmission in Chiba which can be used between station and station, and for this reason even after amalgamations which have akready been made there, the financial savings from the combinations have been very small. Gas power is uneconomical and small companies are able to supply their own needs by using gas engines at no greater cost than purchasing power from the Teikoku Dento. This was soon found out, and gas engine supply was slowly replaced with water power purchased from other concerns. But water power companies in Chiba have no surplus of current and there is a great scarcity of power urgently needed by the Teikoku Dento in that field. It became necessary therefore to



Utsunomiya Intermediate Switching Station on the Transmission Lines of the Inawashiro Hydro-Electric Company



Type "A" Transmission Towers, Inawashiro Hydro-Electric Company's Lines

develop its own water power. To do this would have cost at least Y.1,000 per kilowatt generated, making the cost of light and power too high for practical uses.

Accordingly, the company set out to effect combinations of interests with water power companies in Chiba, and in this way hoped to obtain control of the much needed supply. If this could be effected transmission lines could be built all over Chiba, and all the company's stations connected up by a main line. It was in pursuance of this intention that the Shimotsuke Denryoku was annexed, and there is now enough power available for the company's own use. This combination really opened a new era of expansion for the Teikoku Dento. The Shimotsuke Denryoku Company is a most important acquisition for the Teikoku Dento. Its capital paid up in full before the annexation was Y.3,700,000 and its territory extended from Utsunomiya to Nikko, Imaichi, and Shikamura in Tochigi prefecture: through Noda, Sawara, Tagane, in Ibaraki prefecture, and all over Chiba prefecture, serving more than 70 towns and villages. It owned important hydro-electric generating stations at Nikko, and Ishinada, and was constructing a new power station on the Kinugawa. It also owned important power rights on the Nakagawa. Its high-pressure transmission lines extended beyond its own boundaries, because it bought power from outsiders which it distributed in its own district.

The Teikoku Dento in its Tokyo field, at least, was distinctly not a self-sufficing concern, so far as power was concerned, depending largely on the Tokyo Dento for current. But the Tokyo Dento recently entered upon a period of extremely active expansion of its boundaries, and by purchase, co-operation and investment has so greatly increased its power rights during the past two years that the Teikoku Dento began to fear for its continued independent existence, foreseeing that unless something very radical were not done to secure its position it would probably be driven out of the Tokyo field by lack of water power. Naturally, the annexation of the Shimotsuke Denryoku was a most opportune piece of business for the Teikoku Dento.

In 1912, the Shimotsuke Denryoku supplied 15,923 lights, and 594½ h.p. In 1921, before the combination was effected, it supplied 119,480 lights and 3,091½ h.p. It supplies 43,917 houses in Tochigi, Chiba and Ibaraki prefectures with light. The Teikoku Dento not only got much needed water power from this amalgamation but expanded its boundaries for light and power supply.

Before the annexation, the Teikoku Dento and the Shimotsuke Denryoku were paying dividends of 12 per cent. a year. The amalgamation was expected to permit a higher rate of dividend to be paid, but the terms of the amalgamation, placing the shares issued to the old shareholders of the Shimotsuke on a 10 per cent. basis, and the expenses of continuing the expansion deemed necessary to the company's continued existence as an independent concern, decreased the profit rate last year, and the common shareholders received only 9 per cent. in September, 1921.

The first business term of the new company will be completed on March 31, 1922. The number of lights operated was announced to be 590,729, ten c.p. in December. Power sold amounted to 7,902 h.p. This is a satisfactory situation, and business is known to be gradually expanding.

The head office of the Teikoku Dento K.K. is in Tokyo, with eight branch offices in Chiba prefecture, four in Ibaraki prefecture, two in Saitama prefecture, one in Tokyo prefecture and one in Kanagawa prefecture. There are 17 offices in the Tokyo district.

Westinghouse Radio Broadcasting Service

ON account of the great success and wide-spread interest that has been the outcome of pioneering in radio telephone broadcasting by the Westinghouse Electric & Manufacturing Company, the company has announced a complete plan of covering the entire United States with a service to the home that will allow anyone, anywhere in the country to enjoy the many benefits of radio. The operation of the first radio broadcasting station of its kind in the country at East Pittsburgh, Pennsylvania, for the past twelve months, has opened possibilities hitherto undreamed. From this station alone persons in Canada, New England, Florida, Arizona, the Dakotas, and at greater distances, have been able to enjoy the service. Even in Cuba, Mexico and on ships in the middle Atlantic and on the Gulf of Mexico many have heard the concerts broadcasted from East Pittsburgh.

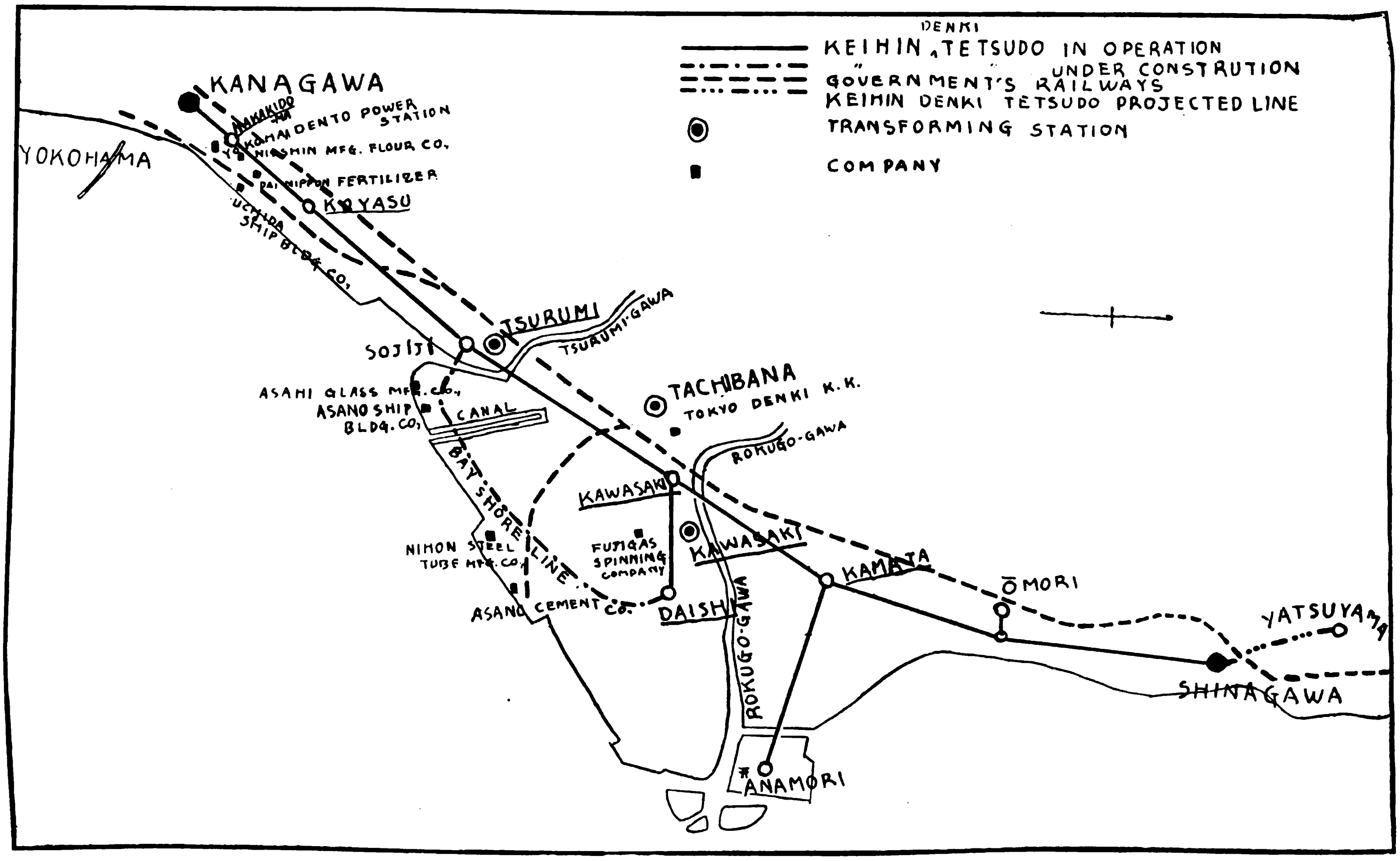
In order to cover certain parts of the country not reached by this station, and to intensively service other parts, the Westinghouse Company has laid out a complete program, and has already added three large stations. At Springfield, Mass., station WBZ supplies New England; at Newark, N. J., station WJZ takes care of the Middle Atlantic and Southern States; and at Chicago, Ill., station KYW services the Middle and Western States.

The fact that the pioneer work of Westinghouse has not been in vain is shown by the fact that although operating a full year, station KDKA at East Pittsburgh continues to interest more people as time progresses. This is due, however, not so much to the novelty of radio telephone broadcasting, but to the well-planned and diversified program that has been established. The service started with the transmission of presidential election returns in November, 1920, and has progressed through the broadcasting of phonograph music, entire church services, speeches of prominent men, acts from theatres, musical recitals, reports of boxing contests, results of baseball, football and basket ball games, complete minstrel shows, government market reports, New York stock market reviews, national and international news from the station at East Pittsburgh. At Springfield, Mass., in addition to many of these features, there is a periodical talk to farmers about market and stock conditions. A feature of the Newark, N.J., broadcasting station has been bedtime stories for the children, marine information, and talks on radio. The complete transmission of grand opera from the Chicago Opera Company productions has been the feature of the recently established station on the Commonwealth-Edison building in Chicago. It is predicted that as a result of the diversified entertainment and information which have been broadcasted through these stations during the past year this service will prove of expanding value and distinctive interest to mankind. In all probability radio will be as popular in the home as the phonograph is to-day, and will be of as great interest to the public as the moving picture show.

The programs as conducted by Westinghouse usually last for an hour each evening, and they are announced far enough in advance to enable everyone interested to know what is contemplated. Such stars as Geraldine Farrar, Rachmaninoff, Telmanyi, Clarence Whitehill, Mary Garden, Muratore, Edith Mason and Rasia have performed for the radio, and the programs are put on a very high plane. Many speakers of note have talked over the radio, some of them being Secretary of Commerce Herbert Hoover, Assistant Secretary of the Navy Theodore Roosevelt, Secretary of War Weeks and Secretary of Labor Davis.

In order to perfect the transmission of music by radio Westinghouse engineers have made considerable research studies of the different frequencies of music. A studio has been built especially for the singing of artists so that the reproduction will be accurate. The studio at East Pittsburgh consists of a room 20-ft. by 30-ft. completely lined with burlap and cloth and without windows so that there will be no reflection of sound. These reports are checked later with the reception qualities at a receiving outfit. A considerable amount of data already obtained indicates the proper methods of transmitting various types of music.

This work is simply a sample of the many things being done to perfect the service and make radio broadcasting a real benefit to the public.



Tokyo-Yokohama Electric Railway

Japanese Electric Railways Expanding

The Tokyo-Yokohama Electric Railway

THE district between the port of Yokohama, Japan's outlet for trade with the Americas, and Tokyo, its capital and largest city, ten years ago was frequently described as "one long village." To-day, a more apt description would be, a " long industrial town." The change in Japanese life brought about by the progress made during the war period 1914-1920 (Spring) has been such that what was formerly pre-eminently an agricultural region supplying farm products to two cities whose populations were about two and a quarter millions, is to-day a building ground for important factories whose needs are only partly served from the population of three millions which have crowded old Yokohama and Tokyo out into the country in a search for more space in which to live. Ten years ago, both Tokyo and Yokohama were beginning to spread beyond their ancient boundaries. The petty Japanese style houses never built with more than two stories, and a Japanese prejudice against living in building with other families (only the lowest classes do that), prevents the growth of large populations in a limited area. It became increasingly difficult to find land within the circumference of the cities to house the growing population.

The line of least resistance was along the Tokyo Bay shore between Tokyo and Yokohama, because along that line there were:

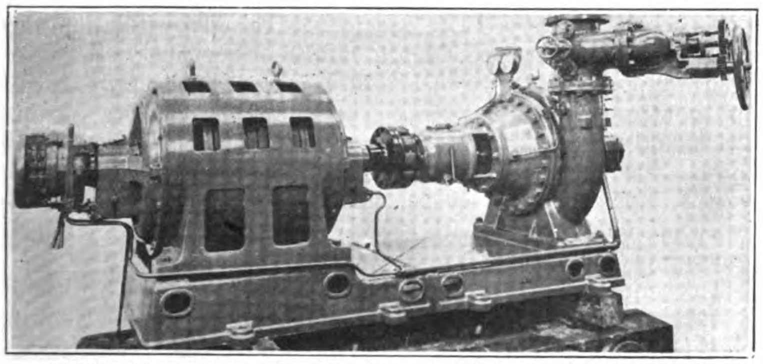
(1) A government railway with several stations at important centres of population between the two cities; (2) an interurban electric railway; (3) a national road none too broad, which furnished the main artery for vehicles, and an even greater hand car traffic between the two c ties.

Homes were slowly pushed out into the country and when the great boom in manufacturing industries came, it was only natural that promoters should turn for building sites to localities where the population was greatest. The land between Tokyo and Yokohama also offered convenient transportation to an open port of regular call, as an attraction to factory builders. As factories sprang up between Tokyo and Yokohama, the population of the towns and villages grew by leaps and bounds, and land prices soared. This drove farmers to sell their ancestral holdings, and eventually practically all the land between Tokyo and Yokohama along the main lines of traffic was owned by factories, house builders, or by land companies.

Much of the growth of this district was primarily helped by transportation facilities, and one of the most important of these facilities, is furnished by the lines of the Keihin Denki Tetsudo (Yokohama-Tokyo Electric Railway). The Keihin Electric Railway was first established in 1897 to operate a short excursion line from Kawasaki station, to Rokugo Bridge, near the popular shrine called Kawasaki Daishi, a distance of 1¼ miles. The company was capitalized at Y.98,000 and was called the Daishi Denki Tetsudo. Its usefulness was unquestioned and its success immediate. It was not until January 1903, that the present Kawasaki-Kanagawa (Yokohama) section was opened for commercial business, to be extended to Shinagawa (Tokyo), by the end of December 1905. Between Yokohama and Tokyo, commercial transportation is even greater than Osaka and Kobe, despite the common illusion held abroad that Kobe and Osaka are the commercial centres of the Japanese empire, a view usually held by traveling salesmen who

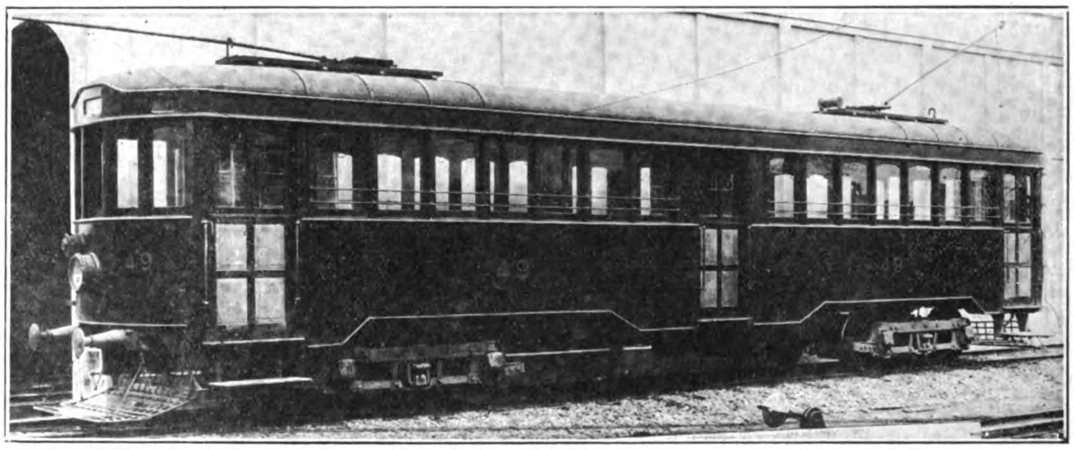
knew nothing of Japanese business methods and consequently found it easier to get orders in less careful Osaka and Kobe than in more exacting Tokyo and Yokohama.

In 1907, the Keihin Electric Railway carried 1,500,000 passengers between Yokohama and Tokyo, but in 1915, when the Imperial Government Railways opened their electric line between the same cities, with stations at all the important population centres, and



500 H.P. Motor Driven Turbine Pump made at the Nagasaki Works of the Mitsubishi Zosen Kaisha

terminals in the hearts of the two cities, the effect on the Keihin line's passenger traffic was immediately disastrous, passengers carried between the two termini, Kanagawa and Shinagawa, both in the suburbs, decreasing to 370,000, and the company's annual dividend rate immediately thereafter fell to the unheard-of low figure 4.8 per cent. Its shares, previously quoted above par (50 yen) fell at once to Y.25.00, a drastic cut. Unfortunately for the Keihin Railway neither its Tokyo nor its Yokohama terminus is in the heart of the city. This has been the great reason for the decline in the number of passengers carried through between Tokyo and Yokohama. However, the loss in through passengers has, to some extent, been made up by the great increase in local passengers carried. And this increase has been particularly marked since the industrial development of the Keihin district began after 1917.



New Type of Passenger Car on the Yokohama-Tokyo Service of the Keihin Electric Railway

Any transport line operating between Tokyo and Yokohama occupies a position of great importance and has most profitable potentialities. Such towns as Tsurumi, Kawasaki, Kamata and Omori, are only getting started in their industrial stride. As the number of factories increase, during coming years, the number of persons having need of the local services of the Keihin Electric Railway will increase accordingly.

Recently the Keihin adopted a plan to open a new line along the bay shore in a most advantageous position. Even if the official line does run through the same general districts the Keihin line nevertheless performs a most important service in assisting the development of new residence and industrial districts south of Tokyo. South of Tokyo, factories have sprung up everywhere, in Oimachi at Rokugogawa near Kawasaki, and in Tsurumi, the Asano shipbuilding works are also in Tsurumi, while on the reclaimed lands at Koyasu near Yokohama an entirely new residence districts, for Yokohama is now developing. The future of the Keihin Railway is therefore brilliantly hopeful.

The Keihin Electric Railway Co. undertakes the supply of lights and electric power in certain of the towns and villages along its line; in Omori, Iriarai, Oimachi, Kawasaki, Haneda, Tsurumi and 13 villages. The growth of industry in Rokugo and Tsurumi recently has greatly stimulated outside demand for power and light. But between Omori and Kamata the Company meets competition with the Tokyo Dento Kabushiki Kaisha and in Tsurumi it encounters competition from the Yokohama Dento, recently absorbed by the Tokyo Dento. Kawasaki, however, lying between these two belts of competition is a monopoly territory of the Keihin, and the future for its supply of lights and power in that town is extremely hopeful, as Kawasaki is the centre of the new industrial belt south of Tokyo. In the first half year of 1921 the Keihin operated 84,420 lights, of which 14,101 were in Kawasaki, 17,609 in Iriarai, and 10,394 in Omori.

Since September, 1921, an arrangement has been made between the Keihin Dentetsu K. K. and the Gunma Suiryoky Denki Kabushiki Kaisha whereby the two companies act together especially for the supply of power in the district operated in by the Keihin Dentetsu. The Gunma company's power station is not yet completed, but will be ready to supply the Keihin with 6,000 kilowatts by June, 1922. This will make the Keihin self-sufficing for power, and free it from one of its greatest anxieties, competition with the Tokyo Dento on either side of its supply boundaries. Eventually, the Gunma Suiryoku will be amalgamated with the Keihin Dentetsu, the directors of the Keihin say.

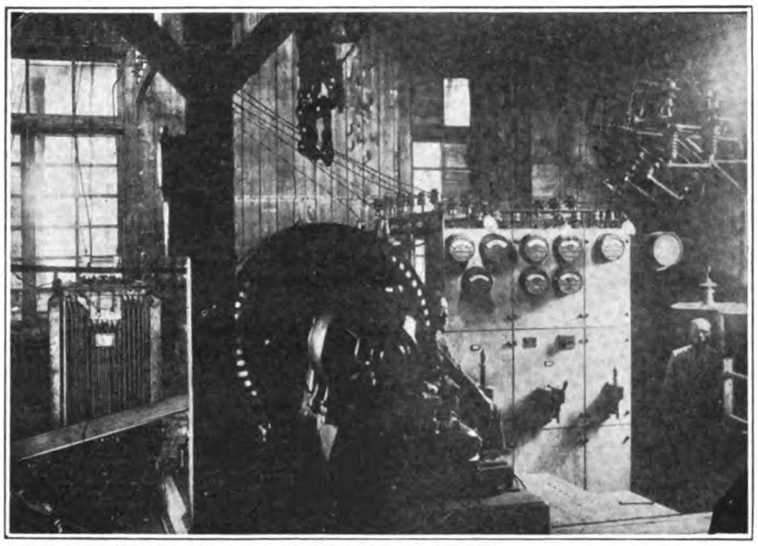
The following table shows the growth of this company's light business :

1919	64,775 lights supplied
1920 June	71,596 ,,
1920 December	77,804 ,,
1921 June	84,420 ,,
1921 December	91,994 ,,

At the same time, despite the slump in manufacturing industries, the quantity of power sold is steadily increasing.

One of the most important questions now confronting the Keihin Denki Kabushiki Kaisha is the problem of a terminus in the heart of Tokyo city. The present terminus, Shinagawa, is extremely difficult to get at, and this inconvenience affects the decrease in the number of through passengers carried between the two great cities. In pursuance of a fixed determination to get into Tokyo from Shinagawa, an arrangement was made for co-operation with the Tokyo municipality whereby the company obtained the right to enter the city by an underground line to be started in two or three years from now. Still another plan is to bring the terminus across the bridge which now separates it from the city and the terminus of the municipal surface lines, and to run the company's cars into, or along side, the Imperial Government Railways' Shinagawa railway station. But against this plan is the fact that there are already eight lines of track now using this station, and there is no space available for widening present accommodation. But the plan has been approved, and the Keihin must bear two-thirds of the expense of necessary construction.

A bridge will be built from the present Shinagawa station of the Keihin across to the Shinagawa railway station, but in order to do this the street between must be widened to accommodate the city surface line tracks, and the Keihin Railway tracks, four tracks in all. To do this the street must be widened 90 feet, for



Teikoka Electric Light Co. Interior of Coal Power Station, Fukuchiyama, Tantan District

it is planned to lay the tracks farther apart than they are now laid.

Negotiations are under way for the purchase of the land required for the right of way. This will take some Y.300,000, about one-third of the value of the property. When this arrangement is completed the city tram lines will use the same terminus platforms as the Keihin Railway Co.

A new line already mentioned is to run between Tsurumi station on the government railways to Daishi station on the Keihin line. The line will be built and operated under the name of another company but the Keihin Electric Company owns all the shares. This is a common expedient, because new electric railway companies are not required to pay taxes for two years after the opening of business. After these two years have been passed it will be annexed to the Keihin. The authorized capital of the company is Y.2,000,000, which will probably all be paid up before the amalgamation takes place. It will run through a district very well suited for factory sites, and it is the intention of this company to build a canal to Kawasaki cutting through the district covered by the Kaigan Kido, and with this end in view it has been buying up land on both sides of its projected canal route, and the railway line as well. This land is owned by a "Home Building Company" a subsidiary of the Electric Railway Company.

The national highway running through Kamata will shortly be rebuilt in another place. This will naturally greatly affect the economic growth of this district, as the road will be widened and bettered. The present line of the Keihin Railway is built on the national road for a distance of two miles between Umeyashiki and Minamizoshi. When the road is rebuilt the Keihin will change its present rail equipment to 100-lb. rails, in place of the 61-lb. rails now in use. The change will cost Y.280,000, it is estimated.

A great amount of money will be required to complete the projected canal which is to open the district between Kawasaki and Tsurumi to the sea through a port at Kawasaki on Tokyo Bay. Running south from Kawasaki station, the Asano shipbuilding yards, and the other Asano enterprises at Tsurumi have built accommodation line generally known as the Asano freight line. Along the bay shore south of this line, and to the east of the Keihin line great efforts are now being made to boost the land for use as factory and home sites. The projected canal from Kawasaki will run from Haccho Nawate along the main line of the Keihin Railway through Noda Mura, and along the Ushioda sea shore, past the Asano Steel Works. It will be 8,100 feet long and 120 feet wide. Each bank will be 72 feet wide and especially built up for factory sites. The building work will give the company some 260,000 *tsubo* of land along the canal which can be sold at a profit over and above all costs of original purchase and construction. In June, 1919, it was decided to invest Y.2,300,00 in this scheme.

In June, 1920, Y.1,230,000, in December Y.1,420,000 and in 1921, another Y.1,770,000 was expended, the original appropriation, having proved insufficient. It was estimated that building the banks and the canal would cost about Y.10 a *tsubo* of land obtained from the construction work. If only Y.25 a *tsubo* can be obtained from the land built up and demand is good, a good profit will be made out of the ingenious scheme. The company is now putting the finishing touches to a new line between Omori sea shore passing through Morigasaki to Anamori, and thence to Daishi, Kawasaki. From Daishi to Tsurumi the newly planned Kaigan Kido will connect up this whole territory. The districts traversed by this line are densely populated around Omori, but in other places they are not so well developed. Land is still cheap, and the new line will help to attract home builders. There are no factories in this district, and it is hoped to keep them out, so this territory ought to prove attractive to prospective home builders. Morigasaki is a very fine place. This scheme plans for residence distiicts between Omori and Daishi, with the factory district south of Daishi extending to Tsurumi.

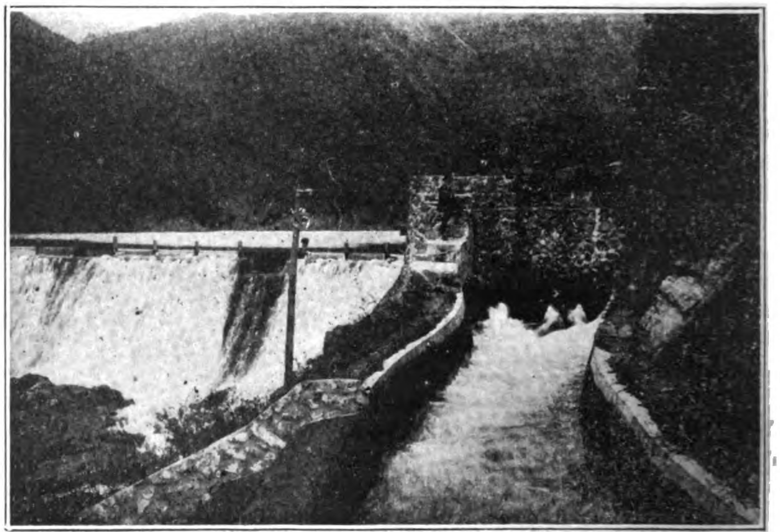
To complete the connection of the line from Anamori to Daishi, it is necessary to bridge the Rokugo River. As the line is now built it is necessary to go to the main line which has a bridge across this river, for through connections. The main line bridge when built cost only Y.260,000, but to build the one needed by the new line will cost, it is estimated, about Y.2,000.000, which is prohibitive. However, Rokugo river is now being banked up and along the embankments factories will be built. If this factory belt is realized then the expense of the bridge can be met from the increased earning the company's line will make by serving it.

The Five Big Electric Railways of the Osaka District

The five big electric railways of the Osaka district (the Kwansai), are the Hanshin Dentetsu K. K., operating between Osaka and Kobe; the Keihan Tetsudo K.K., operating between Osaka and Kyoto; the Nankai Tetsudo, operating between Osaka and Wakayama; the Osaka Denki Kido, operating from Osaka to Nara and the Minomo-Arima Dentetsu K.K., the present Hanshin-Kyuko K.K., operating from Osaka to Kobe, and to Takaradzuka, and to Arima.

Before the war none of these companies, except the Hanshin Dentetsu paid particularly high dividends; their dividends for the second half of 1914 are given in the following table :—

Hanshin Dentetsu..	13 per cent.
Keihan Tetsudo	6 ,,
Hankai Tetsudo	8.5 ,,
Osaka Kido	none ,,
Minomo-Arima Dentetsu.. ..	5 per cent.



Teikoka Electric Light Co. Water Gate at Yamaga Transformer Station, Fukuchiyama, Tantan District

The Osaka Kido was organized and opened for business in the autumn of 1914. During its first term of business it paid no dividends but after a year it was able to pay 7.5 per cent. on preferred shares, and 1.2 per cent. on ordinary shares. But during the seven years from 1914 to 1921, covering the period of war prosperity and panic, all these companies were able to improve their positions, and their dividends for the two terms of 1921 show their advances.

	Profit Rate	(per cent.)	*Dividend Rate*	
	First Term	Second Term	First Term	Second Term
Hanshin Dentetsu	25.7	25.4	13	13
Keihan Tetsudo. .	15.2	14.	10	10
Nankai Tetsudo. .	18.8	21.3	13	13
Osaka Kido ..	13.3	12.4	10	10
Osaka Kyuko ..	17.4	17.9	12	12

(First term from October, 1920-March, 1921.
Second Term from April, 1921-September, 1921.)

The Hanshin Dentetsu shows an enormous profit rate but continues to keep, its dividends down because of the fear of public opinion which is much opposed to the operation of that line through the crowded districts between Osaka and Kobe. It could easily pay 20 per cent. and more, but fear of the consequences deters the directors. The Nankai Tetsudo is in a similar condition, it could easily pay 15 per cent. or more, but is restrained by fear of the company's monopoly of transportation between Osaka and Wakayama being impaired.

The Osaka Kido and the Keihan Dentetsu had heavy construction expenses to meet during 1921, and although their profits on operation were as high as twenty-two and twenty-three per cent., it was impossible to pay dividends like the Nankai and the Hanshin Dentetsu, because of the losses incurred by interest charges on construction works.

The results shown by the Hanshin Kyuko seem to be the worst of all, but this is only because of the new Osaka-Kobe express service line, in which 70 per cent. of the capital of the company is invested. This line has not been long in operation, and construction into the heart of Kobe city is not yet completed. If profits were figured on the basis of the old Minomo-Takaradzuka line, they would have been more than those of any other of the five big companies.

At one time the futures of these companies were looked upon as being rather uncertain, but due to the expansion of industry in the districts served, and to extensions of their services, their futures are now extremely promising. They are, however, all faced with one immediate necessity, that of re-equipping their lines in order to cope with ever-increasing passenger traffic.

It seems natural to suggest that it would be very simple to increase the passenger accommodation by increasing the number of cars to each train. Two or three carriages could be operated like the government electric line around Tokyo. But this change would be accompanied by several difficulties: (1) necessity of improving the present cars; (2) extensions of generating equipment; (3) a complete change of poles carrying the electric wires; (4) rebuilding stations to accommodate longer trains and (5) a general improvement of the railway beds. It is simple enough to effect changes 1 to 4, inclusive, but in improving the railway beds, lies the real problem of increasing passenger accommodation. In order to bring about this change, large amounts of capital are necessary, and there are some parts of certain lines which could not be re-constructed at any cost.

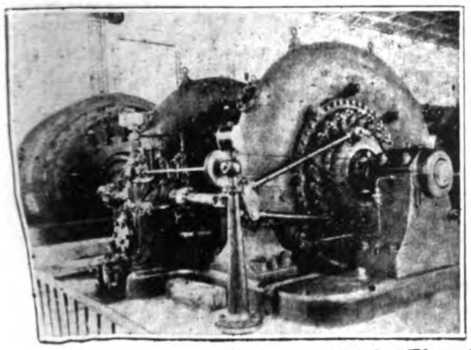
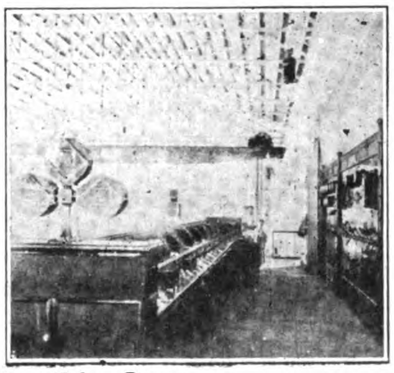
Hanshin Dentetsu

In order to carry out a scheme to operate more than one carriage to a train this company would be obliged to construct a right of way exclusively for railway use. It now uses the principal highways between Kobe and Osaka, running through the most crowded parts of that thickly congested industrial district. It would be essential to re-build the sections between Osaka and Shin-Yodogawa, and between Kobe and Sumiyoshi as elevated railways, so crowded are the streets the present line runs through. By special permission it has been operating two carriage trains since November 1921, but the permission was only granted on condition that the elevated lines mentioned be constructed at the earliest possible date. Consequently, this company can not much longer make such splendid profits. To convert the present railway lines into a right of way exclusively for the use of electric cars, constructing the elevated lines at both ends in Osaka and Kobe, and changing the present 60-pound to 75-pound rails, would cost at least Y.25,000,000. Re-laying the electric wires, improving the cars and reconstructing stations will require another Y.5,000,000. The outside cost would be Y.30,000,000, and the company balks at the expense. A plan has recently been adopted for the construction of a double-track line and the authorities seem to have given their sanction to it. In order to build this new double track at least Y.40,000,000 would be needed. Indecision between the two plans seems to be the reason that nothing has been done so far to relieve a situation fast becoming impossible, especially for the inhabitants of the districts traversed by the company's lines.

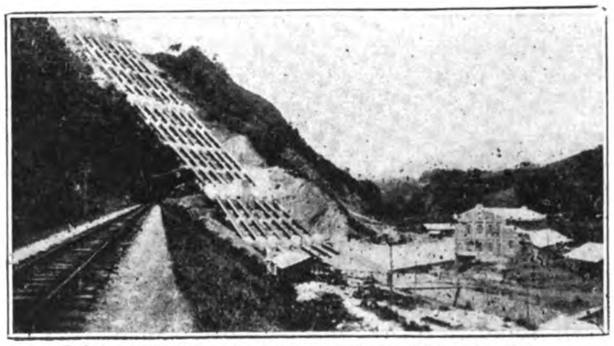
Keihan Dentetsu

The Keihan Dentetsu runs along the Kamogawa (river) from Osaka to the heart of Kyoto, and the entire roadway outside Osaka is for the exclusive use of trams. This line is about the only valuable property of this company. In Osaka, however, it is in a very difficult situation because the roadbed in the city is not for its exclusive use, and it is under obligation to build an overhead railway. There are also some sections between the two cities where the tram passes through towns where the roadbed is not for the exclusive use of the railway line, and in order to make the improvements necessary to make the lines exclusive for their own use, the company must expend from Y.20,000,000 to Y.30,000,000, almost as much as is required by the Hanshin Dentetsu.

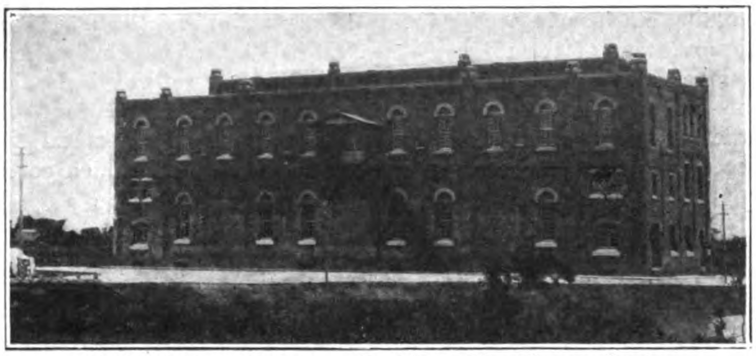
This company has consequently planned the construction of a new double-track line, called the Hokugan line. This line too needs an elevated structure on which to enter the city of Osaka, and in order to obtain an easy entrance, the company recently

Yatsuzawa Hydro-Electric Plant, Tokyo Dento



Tokyo Dento, Yatsuzawa Hydro-Electric Power Plant, Yamanoshi Prefecture



Keihin Electric Railway. Tachibana Transformer Station

bought the Joto line of the imperial government railways at the very high price of Y.5,700,000. This Joto line too must be reconstructed as an overhead railway, and will require serval millions.

Nankai Tetsudo

On the main line between Osaka and Wakayama, the roadbed having been originally constructed for the operation of a steam railway, it is possible to operate as many cars as the company wishes in one train. There are, however, fourteen miles midway between the two cities which must be double-tracked. This is now under construction. The expense is only two or three million yen, not a great problem for the company. On the other hand, the condition of all the lines of this company is very poor, and the roadbed is very much out of repair.

Hanshin Kyuko Tetsudo

In order to operate trains of two cars or more this company must build a short elevated line into Osaka city. It has still to complete its line into the centre of Kobe city, its present terminus being on the outskirts, a condition which much diminishes the number of passengers who would use the line as a fast service to Osaka. Other parts of the line must also be converted to the exclusive use of the railway. All these important changes can be completed with the comparatively small sum of Y.12,000,000 or Y.13,000,000. The reason this expense will be so low, is because the company planned for these extensions and changes from the beginning, and all construction has been carried out in conformity with this idea.

Osaka Kido

This company was originally projected with a capital of Y.3,000,000, but did not complete its construction for less than Y.8,000,000. The investing public deserted it, and it has been very difficult to stimulate popular interest in it ever since. However, unlike most of the railways around Osaka it laid 70-pound rails all along the line, except for a short distance at the entrance into Nara. Consequently this company is in a position to combine any number of cars in one train without first making any material changes in the roadbed, because of the foresightedness of the promoters.

This company is now planning and constructing a line called the Yamato line. It is not because this particular line will be very profitable, but as the dividend rates of this company are somewhat limited by expediency, the new line has been planned with the object of regulating profits, which are bound to increase as time goes on. Besides this, the plan for the new line becomes excellent material for effecting increases in the present capitalization of the company.

The future prospects of the five electric railways are somewhat as related above, and their difficulties all originated in the failure on the part of their promoters to realize the need of preparing or future expansion when the lines were first laid. The Hanshin Dentetsu for instance, was known to be building a line through the best traffic district in all Japan, still the company failed to exercise wise foresight, and consequently has brought upon itself the rivalry of the Hanshin Kyuko line, which is causing real concern to the present management. The principal reason for the defects in construction of the Hanshin is found in the machinations of a group of speculators on the Osaka exchange, known as the "Hanshinkai." The management of the company is not composed of men with real authority, but is vested in the interests of the "Hanshinkai." Consequently the whole policy of this line has been in conformity with the wishes of speculators, who are not interested in future policies, but present and immediate profits.

The Keihan Dentetsu has many plans, but its chief managers are politicians, and their efforts are always directed to securing "rights." They secured the right of building the Hokugan line, and purchased the government's Joto railways, and they are now planning an extension out towards Wakayama. But the real administrators are not men who are capable of accomplishing any betterment of existing service, in which respect this Osaka-Kyoto line is very much like the Kobe-Osaka line.

On the other hand, the Hanshin Kyuko and the Osaka Kido lines are managed by their original founders, who have taken an active interest in the management of the lines. Naturally the real power lies in the hands of the expert managers, who have no fear of having their suggestions rejected by shareholders who lack confidence in their ability.

The Hanshin Kyuko completed the Kobe-Osaka express line during a period when commodity prices were at their very highest, and yet the cost of construction was not high, judging even by prices ruling to-day, which are much below those of two years ago. This is because the work was planned during war-time prosperity, and was carried out gradually and without haste.

The original promoter of the Osaka Kido lost his position because he expended Y.8,000,000 instead of the Y.3,000,000 allowed for the construction of that line; however, the present managing director who has been with the company ever since its foundation, is the real power in its councils.

The Hanshin Dentetsu, no matter how great its profits may be to-day, cannot stand the expense of Y.30,000,000 to Y.40,000,000 which will be necessary to reconstruct the line. The Keihan is inferior to the Hanshin Dentetsu in every way, and it, too, must spend large sums to put its lines in order. It can readily be seen, that the profits of these two companies will tend to decrease in the future.

The future of the Nankai Tetsudo is now somewhat uncertain. For a time there was talk of its being purchased by the government, but since this has died down, it is reported that the Seiyukai are trying to get some of their members the privilege of building a competing line. The roadbed of this railway is not very good, but it does not require any great immediate reconstruction. Slight improvements every year will carry it along without decreasing its profit rates.

As for the Osaka Kido, it can put into operation as many cars as it pleases on each train, without making any changes in the present roadbed. The only defect of this line is its poor geographical position, operating through a very sparsely settled district.

The Hanshin Kyuko may have to spend thirteen million yen in order to complete its present plans. Should it enter the city of Kobe, as it intends, this company should become the most important line operating in the Kansai. Viewed in this light, the most interesting feature in the future of these five big electric railways in the Kansai, is the prospects of the Hanshin Kyuko. Just at present its profits are the lowest on the list, but this condition will undoubtedly change soon.

It is thought in Osaka Kobe financial circles that if the Hanshin Dentetsu fails to make the changes needed in its roadbed, or does not soon build a new double line, through fear of decreasing their rate of profits, that it is destined eventually to be absorbed by the Hanshin Kyuko Dentetsu Kabushiki Kaisha, familiarly called by the Japanese the Hanshin Kyuko.

The Kobe-Osaka Electric Express Line

The Hanshin Kyuko railway is one of the enterprises of the Osaka-Takaradzuka Railway Company, which, between those two places with a branch line to Minomo, operates 18 miles of electric railway, and also supplies electric light and power in the vicinity of Takaradzuka and Minomo. It also conducts a real estate and building company. In 1920, the Osaka-Kobe express service line was opened, and a branch line to Itami was completed. In 1921, a new line between Nishinomiya and Takaradzuka was also finished. The present length of the company's lines is 42 miles.

The line between Osaka and Takaradzuka passes through no big towns and many districts are of such a nature that any increase in their population was not to be expected. But when the lines were completed to Takaradzuka and Minomo, many pleasure seekers were attracted to those places for the baths, and through sales of land at cheap prices, and extensive building operation the districts around these two places have gradually been developed, so that to-day the results are most noticeable in the company's business statements.

TABLE I. PAID-UP CAPITAL. PROFITS AND DIVIDENDS.

	Paid-up Capital	Profits	Dividend Rate per cent.
1918, 1st half year ..	Y. 4,400,000	Y. 301,000	8
1918, 2nd half year ..	5,390,000	397,000	8
1919, 1st half year ..	6,875,000	377,000	8
1919, 2nd half year ..	7,494,000	402,000	8
1920, 1st half year ..	12,275,000	772,000	10
1920, 2nd half year ..	12,275,000	917,000	10
1921, 1st half year ..	18,000,000	1,119,000	10

There has been a great expansion in the value of the company's property since 1918.

TABLE II. VALUE OF PROPERTY OF HANSHIN KYUKO RAILWAY CO.

	1921 1st half-year	1918 1st half-year	Increase
Construction Expenditures	Y.16,662,000	Y.6,248,000	Y.10,414,000
Building Imatsu Generating Station ..	3,742,000	—	3,742,000
Land and Buildings ..	1,127,000	677,000	495,000
Light and Power Costs of Equipment ..	2,383,000	443,000	1,940,000
Total	Y.33,959,000	Y.7,368,000	Y.16,591,000

The fixed capital of the company increased Y.16,591,000 in the three years from 1918 to 1921, but the cost of construction of the Osaka-Kobe express line, 17 miles and the Itami branch 19 miles was Y.10,414,000. The Osaka-Kobe line was begun in September, 1918, completed in 1920, and put into operation on July 16 the same year. But the results of business cannot yet be positively regarded, it is necessary to consider several other matters first.

When the Imatsu power station was first planned it was intended to build a generating station for 10,000 kilowatts, consisting of 25,000 kilowatt generators. Later it was seen that there was much disadvantage in having only two generators to operate and so it was determined to add one more 5,000-kilowatt generator to the equipment. This third generator will be kept in reserve, 10,000 kilowatts being the maximum requirement for power. This plan was adopted in the days when finance was easy, but since the hard times set in demand for power has noticeably decreased, and the boundaries of supply in which this company operates are not sufficiently extended to consume all the power that this new plant will generate. This state of affairs has naturally much upset the company's calculations, and recently negotiations were concluded with the Ujigawa Denryoku Co., by which the latter company puts up the capital to take over the plant and operate it. So the 15,000 kilowatts is to go to the Ujigawa, and the Ujigawa will supply 5,000 kilowatts to be used by the Hanshin Kyuko line. Up to the present time there has been no profit on the capital invested in this power plant, but there were debts of Y.3,000,000 which were included in the costs of construction, so it has been difficult to make any profit on the investment.

A general consideration of the expansion of equipment and income of the company will show that the reason the rate of profit has not increased during the past few years has been the cost of constructing the Osaka-Kobe express line.

TABLE III. INCOME AND BUSINESS.

(000 omitted)

1918, 1st half ..	Y.490	—	Y.134	Y.140
1918, 2nd half ..	519	—	137	137
1919, 1st half ..	673	—	152	109
1919, 2nd half ..	711	—	173	313
1920, 1st half ..	967	249	208	249
1920, 2nd half ..	898	571	221	345
1921, 1st half ..	1,029	641	426	460

It can easily be seen from this table that income is gradually increasing. Until the end of 1920 the income from the Takaradzuka line gradually increased, but it fell off in the second half of 1920, only to increase very markedly in 1921. This is a holiday-making line, and is used by merry-makers from Osaka business is usually good, but the panic of 1920 stopped a great deal of holiday spending, and the line did not recover from this until the first half of 1921 when the spring season tempted holiday seekers out to Takaradzuka again.

The Kobe-Osaka line was only opened two months in the first half of 1920, but in the second half it earned Y.571,000, and in the first half of 1921, reached earnings of Y.641,000. Unlike the Takaradzuka line the Kobe-Osaka line is not affected by the season's gaieties, and it is developing steadily in the most satisfactory manner.

Up to the first half of 1921 the rate of increase of this business was steady, and in that term the Inagawa Company was annexed in the first half of 1921 this income was about 20 per cent. of the total.

With the object of harmonizing its whole income the company carries a large amount of temporary loans, to keep down dividends.

Like other light and power companies operating electric railways it is necessary to look at from the point of view of its income from the railways it operates. In 1921, first half, the income from the Takaradzuka line was Y.1,029,000 and from the Kobe line Y.641,000. The income from the Kobe line was 63 per cent. of that from the Takaradzuka line, but the number of persons traveling is greatly different.

TABLE IV. PASSENGERS ON ELECTRIC RAILWAYS.

	Takaradzuka Line	Kobe Line
1918, 1st half	5,002,000	—
„ 2nd half	5,109,000	—
1919, 1st half	5,759,000	—
„ 2nd half	6,465,000	—
1920, 1st half	7,009,000	828,000
„ 2nd half	6,556,000	2,226,000
1921, 1st half	7,728,000	2,584,000

In 1921, first half, the number of passengers on the Kobe line was not one-third of that traveling on the Takaradzuka line but the income was 63 per cent. There is room for a great expansion of population along the Kobe-Osaka line which does not run through the main populated villages, but lines rather far away from such

towns as Nishinomiya, Koroen, Ashiya, Sumiyoshi, etc., so that the future of this line is extremely promising.

Speaking of the Kobe-Osaka line it is necessary to call attention to the fact that there are many electric lines in the suburbs of Osaka which were laid down very carelessly along the lines of touching the districts in which most passenger were to be found. They were built along the main streets, and now when traffic has increased so enormously can no longer operate at high speeds. The new line warned by these examples owns its own roadbed, and nowhere uses the public roads. Its roadbed, rails, wire carriers, and in fact, all its equipment is of the latest standard, and finest make, and cars can accordingly be run at very high speed. The time on this line between Kobe and Osaka is only 40 minutes, while on the Hanshin electric railway, a separate company, it takes an hour between the two cities. In the first half of 1921 the Hanshin electric carried between the terminals at Kobe and Osaka 2,600,000 passengers. The Hanshin Kyuko about half that number of through passengers. The reason so many passengers patronize the Hanshin electric instead of the Hanshin Kyuko is because the terminal in Kobe is in the heart of the city. The Hanshin Kyuko terminal is in the suburbs and very inconveniently located. It is now necessary to build into the city itself, but because of a plan the municipality has for beautifying Kobe city, the railway company must enter by an underground line which will cost a prohibitive sum, and take too long a time. A request has been presented to the authorities that they permit the construction of an elevated line instead.

This will take three years to build. But it will have its terminal in Motomachi 1-chome, near Sannomiya station. And because of some street plans of the city of Osaka the company will also have to build an elevated into the heart of the city of Osaka from Jussan. This line will have a double track. Expenses of constructing the elevated in Kobe are estimated at Y.7,000,000, and from Jussan to Osaka Y.3,500,000, to which preliminary expenses of Y.500,000 must be added, bringing the total to Y.11,000,000. To raise this sum the capital must be increased, but if this is done the rate of income will not be sufficient to attract capital. So it is planned to raise a company loan which will pay 8 per cent. interest. This will be cheaper than raising capital, which nowadays requires at least 10 per cent. returns in order to be attractive to investors.

The following statement of the liabilities and assets of the company was published at the end of the first half of the fiscal year 1921:—

Table V. Assets.

Unpaid Capital	Y.6,000,000
Construction Costs	16,662,128
Imatsu Generating Station Construction Costs	3,741,637
Cost of Land and Buildings	1,172,005
Land and Buildings sold oni nstalments not yet paid	954,187
Power and Light Equipment	383,245
Tools, etc.	15,959
Goods in Warehouses	393,447
Bank Deposits	234,288
Negotiable Securities	23,442
Temporary Payments	43,939
Uncollected Income	89,032
Cash on hand	20,974
Total	Y.31,734,337

Table VI. Liabilities.

Capital	Y.24,000,000
Company Debentures	2,000,000
Legal Reserve	352,200
Special Reserve	181,500
Dividend Equalization Reserve	200,000
Reserve for Bonus	52,898
Deposits of Company Employees	70,820
Money Deposit for Character Guarantees	30,936
Temporary Loans	3,000,000
Temporary Petty Loans	155,397
Unpaid Dividends	26,980
Unpaid Interest on Debentures	61,009
Other Unpaid Accounts	277,073
Carried over from Previous Term	206,805
Profit for the term	1,118,716
Total	Y.31,734,337

The future estimate of business counts on 10,000 passengers a day riding between Osaka and Kobe. If this is possible to realize then it will not be difficult for the company to pay a dividend of 10 per cent., even if it is necessary to borrow enough money to pay for the improvements required in Kobe and Osaka. These passengers will pay 40 sen each, and the profits from the traffic is expected to increase Y.500,000 a term. This will be a sum sufficient to meet all interest charges and leave a slight balance for payment of dividends.

Taking into consideration the important industrial district through which the new Kobe-Osaka runs, the future of the line should be very promising indeed. As the lands fill up with factories and home makers the company's revenue will increase from passenger service, freight service, light and power service, and from the sale of land and buildings on the instalment plan. The Takaradzuka pleasure resort grows more popular every year, and will eventually become one of the greatest pleasure resorts in the Far East when all the improvements planned are instaled.

Iron Ore in the Malay Peninsula

IN the report for 1920 of the general adviser to the government of Johore, mention is made of the opening of an iron mine on the left bank of the Batu Pahat River, a mining concession over 50 acres having been issued to a Japanese. The ore is mainly hematite, containing about 65 per cent. of iron, and there is sufficient ore in sight for five years' working. Later information to hand, down to the end of September, shows that the deposit is being actively worked, and the monthly output is now 8,500 tons of ore of excellent quality. The ore is being shipped to Japan. It is reported officially that similar deposits are known to exist in Johore and other parts of the Malay peninsula. As regards the question whether the ore can be produced at a price that would find for it a ready market, Mr. Isheharo, managing partner of Nanyo Kogyo Koshi, who is in charge of the mining operations at Bata Pahat, has contributed an article to a Singapore newspaper in which he states that hematite ore is the commonest form in Malaya. Magnetite is also found in some quantity, but limonite is less frequent. He discusses the possibility of smelting the ore in Malaya, and arrives at the conclusion that, at present at least, it would be useless to attempt to smelt the ore locally. The price for which the ore can be sold in India is given as $2, in China $3 and in Japan $8—the value of the Straits Settlement dollar being 2s. 4d. If exported to India or China, the price would not be enough to pay for the freight; but if a specially low rate were given to Japan, it would be possible to dispose of the ore there at a profit. Japan's requirements are 1,200,000 tons of ore yearly. Half of that amount is already mined in Japan, and the remainder has hitherto been supplied by China. These ores contain from 50 to 60 per cent. of iron, and are bought at $8 per ton, whereas the ore from Malaya contains 65 per cent. and is worth about $10.50, though it has been sold at $10 in order to compete with ore from other sources. The usual freight to Japan is from $7 to $8 per ton, and other expenses are about $3 per ton. At these rates, it is obvious that it would be impossible to mine and market the Johore deposits at a profit, so the Japanese company charters steamers which would otherwise be returning in ballast to Japan. In the course of a year some 50,000 tons of cargo space is available in this way and the Japanese miners are able to export the ore at the freight of $5.50 per ton.

The University of Hongkong

The Work and Equipment of the Engineering Faculty

By C. H. MIDDLETON SMITH

THE importance of technical education in China is more appreciated to-day than it was a few years ago. The purpose of the engineer is to develope the vast resources of nature for the use and convenience of mankind. That China possesses vast natural resources will probably not be disputed. Everyone who has traveled through the various provinces has been impressed by the evidence of latent mineral wealth. Experts who know China are enthusiastic on this subject. They see that not only is there immense latent mineral wealth, awaiting liberation in order to benefit greatly the world and China—and China most of all; there are also vast possibilities of improving the vegetable wealth by the application of scientific knowledge in the way of water supply, transport, etc. China offers, at hand, an almost inexhaustible army of intelligent and most industrious workmen. What then is retarding the development of the great natural resources of the country when it is so obviously to the benefit of everyone that these resources should be made available for the use and convenience of mankind?

The answer is quite simple. This greatly desired utilization of the gifts of nature has not yet taken place because of ignorance. It is useless to regret; sometimes it is waste of time even to enumerate the past mistakes of nations or individuals. The practical man accepts the present position and wastes neither energy nor time over regrets, but sees what is desirable and works for that end.

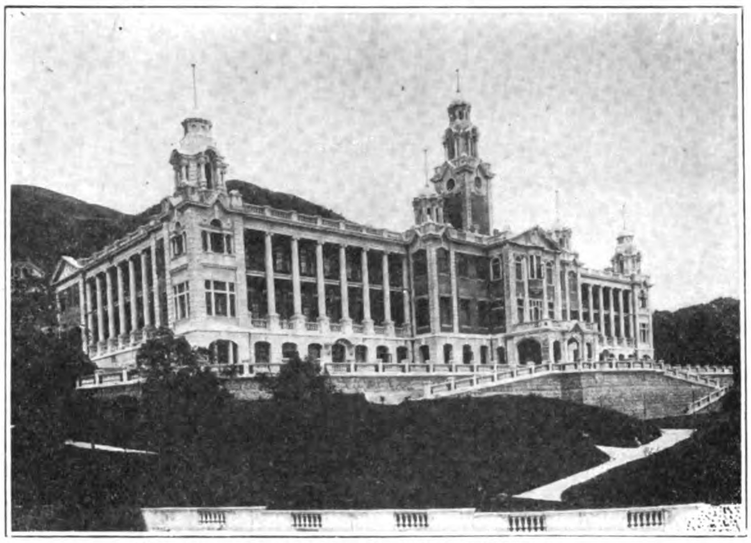
Until quite recent times the Chinese have been entirely ignorant of modern scientific methods. Even to-day only the merest fraction of one per cent. of the population have any notion of what is meant by the word "Engineer." The number of Chinese technical men qualified by training and experience to become full members of the British institutions of civil, mechanical or electrical engineers is probably less than a hundred. Yet the population of China is estimated at about 400,000,000. There are probably nearly 10,000 British professionally qualified engineers (out of a population so much smaller) corresponding to China's one hundred. There are, it is true, a number of young Chinese who have been trained in engineering in Europe or America during the last twenty years and some of them are doing excellent work. In due time they should acquire the experience needed in order to carry out with success some of the more urgent engineering schemes in China. Their weakness is usually inexperience, and a training not always very suitable for the peculiar conditions that obtain in China. It is not too much to say that with settled political conditions and a more general appreciation of scientific work on the part of government officials and bankers, there would be useful employment for hundreds of thousands of Chinese professional engineers in the vast territory of their own country. Foreign engineers will for many years be needed to give advice as experts on special problems, but the natural resources of China will never be developed until the Chinese themselves understand and can carry out engineering projects.

SIR WILLIAM EDWIN BRUNYATE, K.C.M.G.

Vice-Chancellor and Principal of the University of Hongkong

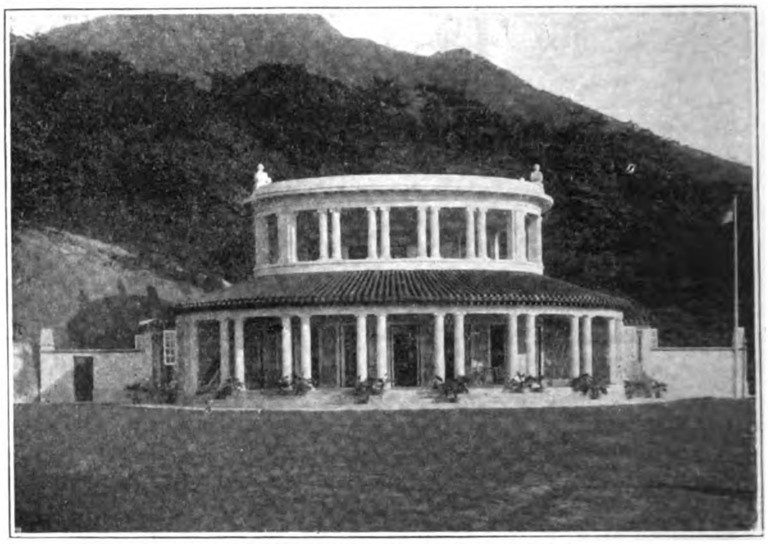
An Object Lesson

A few months ago an engineer whose fame is world-wide addressed the students of the University of Hongkong. Sir Maurice Fitz Maurice, although visiting Hongkong to give expert civil engineering advice on problems connected with the harbor, showed great interest in the aims and work of those giving and receiving technical education at the local university. He remarked that never, in all of his world-wide travels, had he visited a place where there were, within a short distance of each other, so many different examples of the work of the engineer. He said that, within about three or four miles of the hall in which he was speaking, there were three large and up-to-date dockyards, in two of which ocean-going ships were being built, while the third undertook the repairs of the largest ships on the Pacific. There were also, he said, a number of small engine and ship-repairing yards. Other works that he mentioned were the four quite big electrical power stations—two using steam turbines, one with slow-speed reciprocating engines and the other working with gas engines. Then he mentioned the various activities of the very efficient local public works department. The splendid motor roads, built in the face of almost insuperable difficulties; the water supply system with its various reservoirs; and the great dam at Tytam, the biggest thing of its kind East of India; the many modern factories whose products range from cement to cigarettes or from rope or leather; the steam railway on the mainland with its locomotive works and the unique cable tram that hauls a coach by means of a wire rope up to a height of about 1,200-ft.; the electric tramways on



Hongkong University, the Main Buildings

(These buildings include lecture rooms and laboratories. Residential quarters are within a few minutes' walk)



Hongkong University, the Athletic Pavilion

(This is a building situated on the Recreation Ground which is about half-a-mile distant from the University main buildings). The University sports, cricket matches, tennis and other competitions are notable part of student life)

the island and the automobile repair shops such as are to be found only in four or five places in China ; the sight of the seaplanes, the wireless masts and the great variety of shipping in one of the finest harbors of the world ; the reinforced-concrete buildings, the ice-factory and the systematic drainage and public health work ; all of these things, and many others, were mentioned by the famous expert as object lessons and inspirations for the young engineer in training in Hongkong.

The Engineering Graduates

It should be explained that the purposes of some of the founders of the university were made evident by the fact that the first chair founded at Hongkong was the Taikoo chair of engineering. For a whole year 1912-13 there was only one professor in the university and his work was engineering. In that first session fifty-four undergraduates enrolled in the faculties of medicine, engineering and arts and of those fifty-four no less than thirty-seven elected to take the engineering courses.

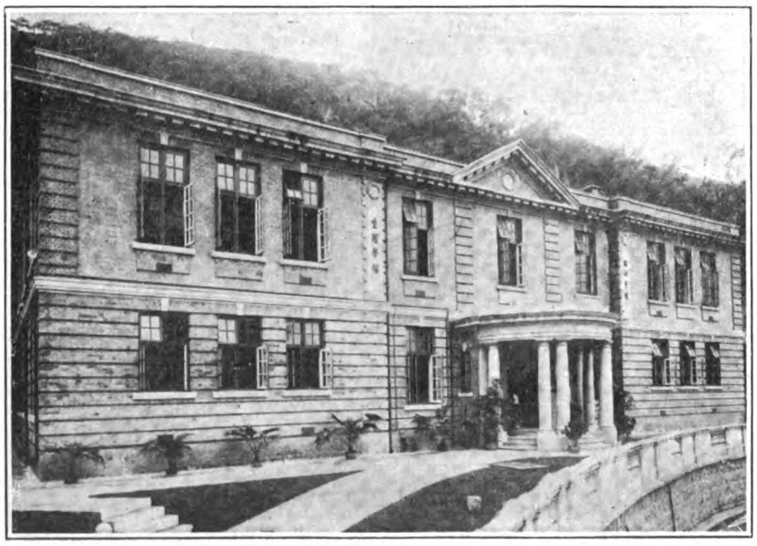
At present (1922) there are 132 graduates of the university who have passed the necessary examinations. Of those the graduates of the various faculties are as follows : Medicine, 46 ; engineering 77 ; arts 19.

Of the engineering graduates 42 specialized in civil engineering, 16 in mechanical engineering and 19 in electrical engineering.

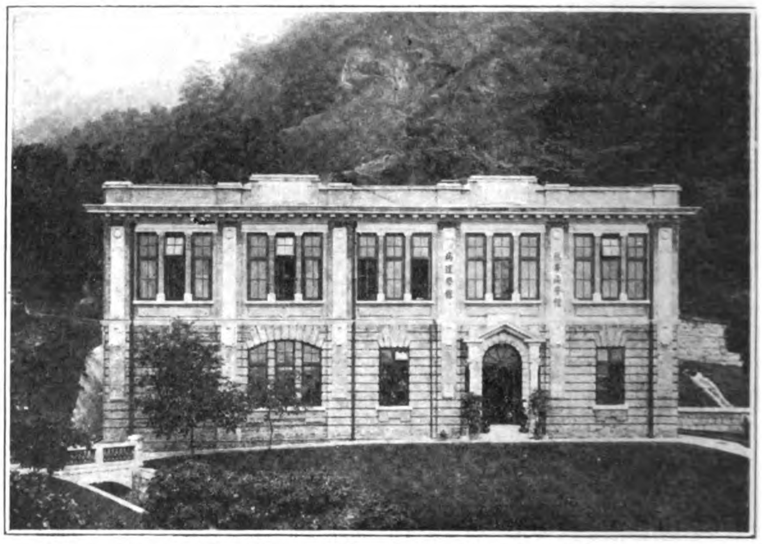
Of the engineering graduates, five have been awarded first-class honours degrees, and 18 second-class honours. These awards are made on the recommendation of examiners of the University of London who have certified that the honors standard of the engineering degree of the University of Hongkong is the same as that of the University of London.

The details of the work done by the engineering students will be given later. Suffice is to say now that, in general, the technical instruction given at Hongkong is similar to that given in the University of London. The only differences are these. In London the course after matriculation can be completed in three years whereas in Hongkong the course takes four years. That is to make allowance for the defective teaching of science in the Far Eastern schools which act as feeders to the University of Hongkong and also because of the language difficulty and the entire novelty of any engineering work to the majority of Far Eastern students. In London the engineering student is allowed a free choice of certain engineering subjects in his final examinations. In Hongkong he must study the elementary work of civil, mechanical and electrical engineering in his first three years at the university. During his final year he selects to specialize either as a civil, mechanical or electrical engineer. In actual fact some students have elected to stay a year after graduation in order to study one of the other courses.

The object of this arrangement is fairly obvious. In an undeveloped country, such as is China, it is essential that every



University of Hongkong, Medical Buildings, Schools of Anatomy and Physiology



University of Hongkong, Schools of Tropical Medicine and Pathology

engineering graduate should know the elements of the three branches of engineering. In his work the civil engineer needs to know how engines work and the principles of various mechanisms as well as requiring a knowledge of electric power. Similarly the mechanical or electrical engineer needs to know the principles for the design of structures, etc.

The engineering students of the University of Hongkong have come from all parts of the Far East. They have traveled to their *alma mater*, from Penang to Peking, from Java, Siam, Australia, India, and other lands and from nearly all of the eighteen Chinese provinces but especially from Yunnan, Chihli, Hupeh and Kwangtung. Mostly the sons of merchants, some of them come from families of officials. Some of them, especially those from the Malay Federated States, cannot speak Chinese at all; many of them speak Chinese dialects which are intelligible only to those of their fellow students who come from the same districts. All of them speak and write English, for the entrance, or matriculation examination is conducted in English with various compulsory papers to test especially, their knowledge of the English language. All of the technical lectures and instruction is given in English.

The Beginnings

As we glance rapidly over the history of the nine years since, in 1912, the university opened its doors to students, it seems almost incredible that so much has been accomplished. It is not proposed to go over the full story of the inception and the working out of the idea of technical instruction in Hongkong. That is to be found in the university calendar which is published annually and which may be had on application to the registrar of the university or the dean of the faculty of engineering. There are, however, a few facts of interest not set forth in the calendar and one or two of them may be related.

Firstly, it may be acknowledged that when the university opened its doors in 1912 its financial resources were entirely inadequate for the work which it was proposed to do. After ten years its annual revenue is almost four times as great as it was in 1912 and that fact of itself demonstrates beyond cavil that there are people in China who wish to encourage and develop this institution. It would be foolish to suggest that the technical departments of the university do not require further funds; there is probably no technical institution in the world that does not wish to improve its equipment and work; in China, more than any other part of the world, there is the possibility of enormous expansion in technical education. In the University of Cambridge, England, there are now about 1,100 engineering students as compared with, say, 200 in pre-war days. In the University of London the number of engineering students is probably four or five times as many as were at work there ten years ago. In the universities in America the engineering graduation classes include many hundreds of students. As the facilities at Hongkong are improved, and the opportunities for studying engineering are more generally known, there will be many hundreds (perhaps thousands, of technical students. At present about twenty new students are enrolled in the engineering faculty each year and the total number of such students is under a hundred. Let us now consider the work which they do during their four years of study and the type of life they lead during their careers as undergraduates.

The Training

Although students not studying for a degree may be admitted to lectures and technical instruction, the experience of the past ten years has proved that very few students take the engineering courses except with the hope of obtaining a degree. Throughout the four years' course the engineering student spends about two hours each day at lectures and four hours in the laboratories, workshops or drawing office. The first two years are occupied in instruction in physics, chemistry, mathematics and mechanical engineering.

In the third year the student spends the whole of his time at work in the subjects called prime movers, materials and structures and electrical technology. These are really the basic subjects needed in mechanical, civil and electrical engineering. Surveying is also done by certain students.

In the fourth year the course is more specialized. The future civil engineers take structures, surveying and hydraulics. The future mechanical engineers take prime movers, electrical generation and distribution and design of engines and machines. The students specializing in electrical engineering take the first two subjects in common with the mechanical engineers and electrical design as a third subject.

The Cost of Technical Education

It must be confessed that the original promotors of the university did not realize that modern engineering instruction requires a great deal of money to be spent on buildings—especially designed as laboratories and workshops equipment and staff. Let it be assumed for a moment that there is no technical education in Hongkong and that it is proposed to create only a school of engineering (civil, mechanical and electrical) of a university type. The following is a rough estimate of the cost:—

First of all a site for a building is needed, giving a ground floor area of about 50,000 sq. ft. (say 115 acres) for offices and buildings for instructional purposes. To put it in another way, the present floor area actually occupied by the lecture rooms, drawing offices, laboratories and workshops used by the engineering students (including physics and chemistry rooms) is 29,200 sq. ft. Plans are in preparation for extensions which will cover a floor area of about 45,000 sq. ft. In these days of increased cost of buildings these various rooms, laboratories offices and staff and students' residences for the faculty of engineering only would cost about a million and a quarter dollars. There is also the site, which would be very costly.

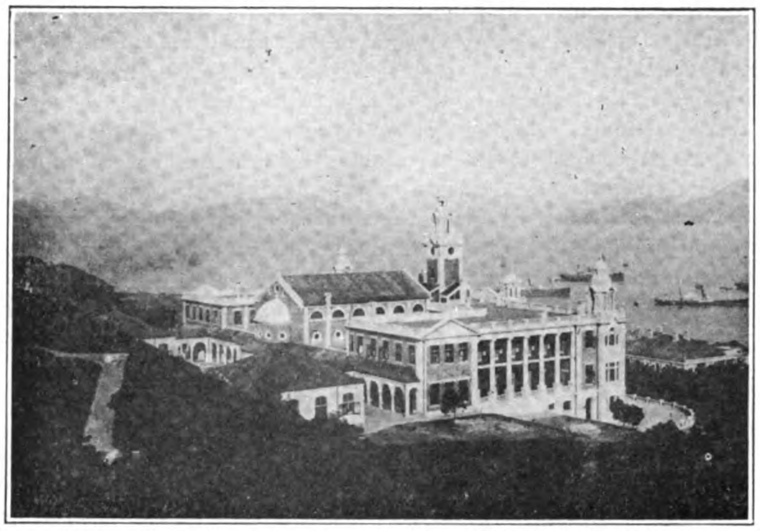
The present equipment now used by the engineering students may be valued at £40,000 and it is hoped to increase the equipment by machines valued at £20,000, in the near future.

Students' common rooms, residental quarters, recreation grounds, etc., also cost money.

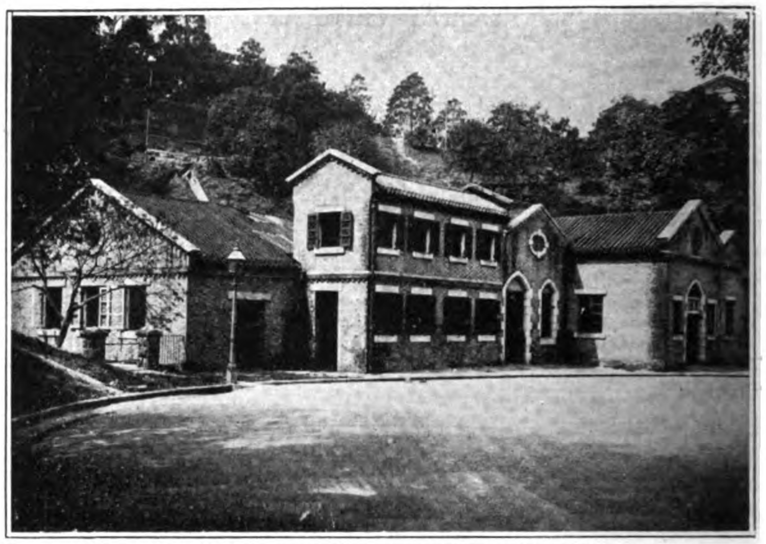
To re-create a school of engineering at Hongkong such as exists to-day would cost about 2½ million dollars for capital outlay on land, buildings and equipment together with a capital sum of at least one million dollars for endowment purposes for payment of staff and general maintenance of buildings and equipment. That is assuming that there would be as at present, a steady income from students' fees which are $300 a year for instruction and $240 a year for board and residence. A solely technical institution is less educative than a university which includes students in medicine, arts, education and commerce; it cannot be sufficiently emphasized that the student learns lessons about life by meeting students of other branches of learning. We have, however, no space to elaborate on the cost of a modern university.

The balance sheet and accounts of the university at December 31st, 1921, were published and we have made a few interesting excerpts. The total assets are given as $4,365,498, of which buildings and equipment total $1,359,150 and investments (for endowments) $2,899,061. We very much doubt whether any other educational institution in China, with the exception of the Union Medical College of Peking, has such a strong financial bases as an endowment fund of nearly three million dollars, in addition to buildings, equipment, etc., valued at $1,359,150. The land is not regarded as an asset, and its value is therefore in the balance sheet as it is in reality a trust; but a conservative estimate of the value of one million square feet at West Point, Hongkong, is one million dollars.

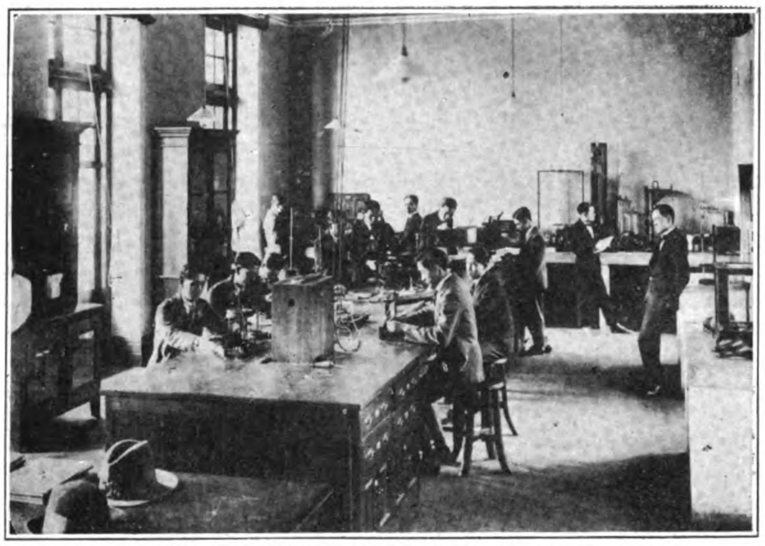
The annual income during 1921 seems to have been nearly $400,000 and it is worth nothing as an indication of the progress that, in 1914 (eight years ago) the annual income was less than $150,000.



University of Hongkong, General View of the Main Buildings

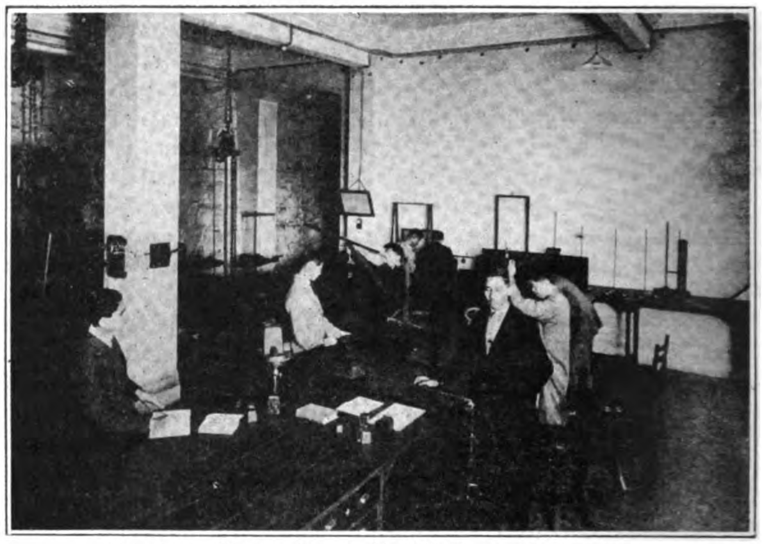


University of Hongkong, Steam and Hydraulics Laboratories



Hongkong University, Physics Laboratory

(This picture shows engineering students in the early stages of their training at work in the physics laboratory)

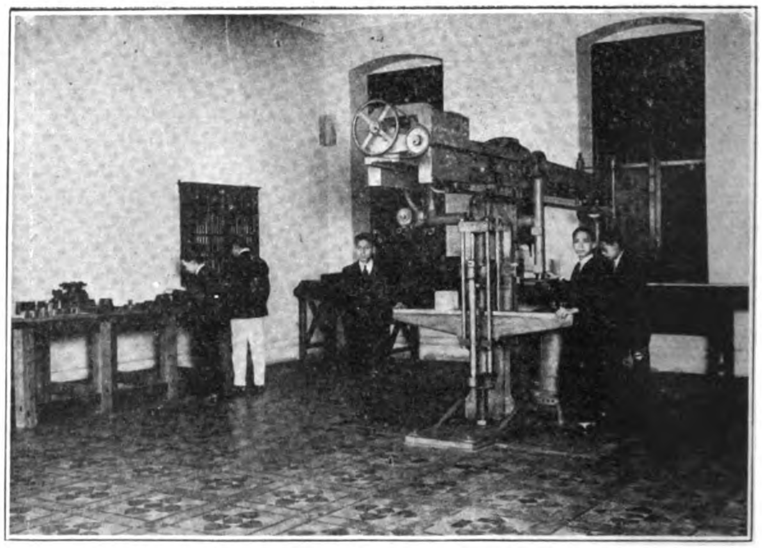


Hongkong University, applied Mechanics Laboratory

(Engineering students are here seen making experiments in applied mechanics. This work teaches them technical terms and applied mathematics as well as general engineering principles in their first year)

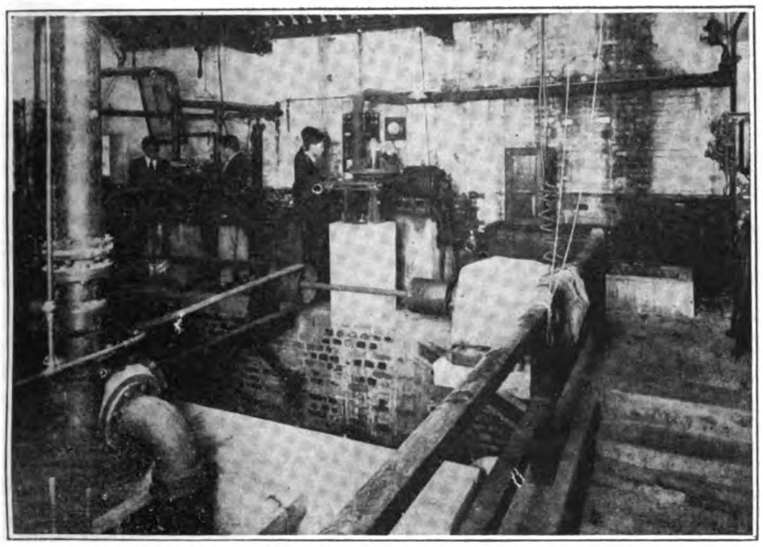
Hongkong University, the Electrical Technology Laboratory

(In this laboratory experiments in connection with measurements of resistances, small cements and instrument tests are carried out)



Hongkong University, Strength of Materials Laboratories

(This picture shows a 30-ton testing machine which is electrically controlled)



Hongkong University, the Hydraulics Laboratory

(Students are here seen testing a small Pelton wheel and electrically driven centrifugal pump. Other pumps, tanks, channels, etc., provide further experiments)

The engineering faculty has been fortunate in obtaining practical support. Messrs. Butterfield & Swire, Ltd., and associated firms, gave £40,000 to the original endowment fund and have since presented $100,000 for the engineering work. The Taikoo chair is named after the firms. Sir Robert Ho Tung has recently given $100,000 for new workshops.

These figures have been quoted, not with any intention of suggesting that the endowment fund is adequate or that further money is not required. In actual fact plans are being prepared for extensions of the engineering laboratories and workshops which will require at least half a million dollars for completion.

Fortunately there is, at present, no need to duplicate this great expense on behalf of technical education. It is possible to increase the accommodation in Hongkong for 500 technical students at some additional expense but at nothing like the expense involved for even two similar schools of engineering with only a hundred students each. One hundred students can listen to a lecture as attentively as ten of the subjects is interesting.

Excluding the professors of physics, chemistry and mathematics, there are at present seven full-time professors and lecturers, a workshop instructor and a demonstrator (all from England) on the staff of the engineering faculty. They hold the same qualifications as the staff in similar positions in the universities of England. There are also Chinese graduates as demonstrators and a number of workmen needed for maintenance of equipment and the electricity supply system for the whole university.

It must be remembered that in addition to the technical staff there is the general administrative staff of the university including the vice-chancellor, and the registrar concerned with all three faculties of the university.

Workshops and Laboratories

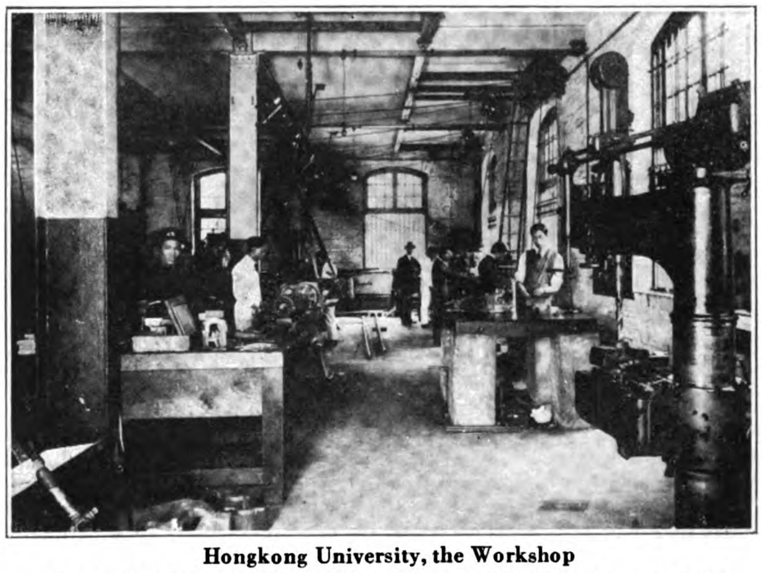
During the last nine years there have been many thousands of visitors to the university. They usually find great interest in the scientific equipment and the machinery which is at work.

The first engineering building visited is generally the electrical power station. This is a separate building adjacent to the main university building. It is about 60-ft. by 60-ft. It contains numerous gas and oil engines many of which are used for the supply of electric light and power and all of which are used by the students for testing purposes.

The equipment in this building consists of (1) 35 B.H.P. Campbell gas engine with suction producer coupled direct to a 20 K.W. G.E.C. (London) dynamo; (2) a 15 B.H.P. Crossley gas engine using either town or suction gas, coupled direct to an 8 K.W. Lancashire Dynamo Motor Co. dynamo; (3) a 10 B.H.P. two cylinder Gardner oil engine coupled to a dynamo; (4) an 8 B.H.P. Campbell semi-diesel oil engine coupled by chain to a 7 K.W. dynamo; (5) a 15 B.H.P. Campbell vertical oil engine driving a 7.5 K.W.D. dynamo; (6) a 25 B.H.P. Daimlet silent knight petrol engine; (7) a 7½ B.H.P. Thornycroft marine motor; (8) a 7 8 B.H.P. Ruston Proctor portable oil engine; (9) a 9 B.H.P. Westinghouse cross oil engine driving a Reavell air compressor; (10) a 4 B.H.P. Turner paraffin engine coupled to a Siemen's dynamo and also fitted for brake tests; (11) a so-light Lister Bruston automatic plant (driven by a petrol engine).

Adjoining the power station is the workshops. The machine and fitting shop is 60-ft. by 30-ft. It contains a motor-driven craven planing machine; a motor-driven Hulse shaping machine; a motor-driven Archdale radial drilling machine; a motor-driven combine tool and dry grinding machine and a 3¼-in. motor-driven Drummond lathe, a 6-in. Lang lathe, a 5-in. Buck and Hickman lathe, a Dickinson lathe, a 5-in. Spencer lathe, a Ward capstan lathe, a Milne lathe, a Kendoll and Gent screwing machine, a 10-in. Selson shaping machine, a Jones and Shipmon high-speed drilling machine, a Brown and Ward light drilling machine, a Holbrook & Sons bench-drilling machine, an Alfred Herbert twist drill grinder, an E. & G. Herbert hacksaw, a Wicksteed mechanical saw as well as the usual tools and a complete set of micrometers, gauges, etc.

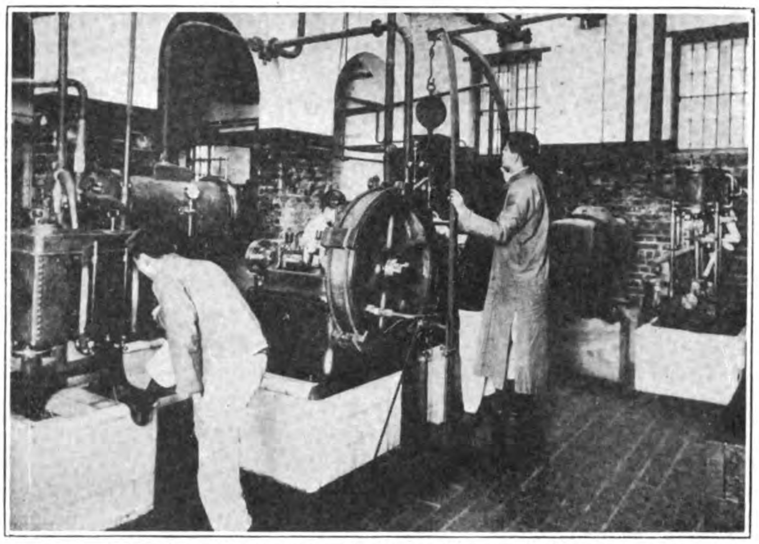
The equipment for steam and hydraulics is housed in a building adjacent to the power station, although on a lower level. This building was originally used by the government as a pumping station and has been adapted to its present purposes although it is hoped that at no distant date a new building will be erected for steam and hydraulics. The plant now installed consists of (*a*) two water-tube boilers (one is a Babcock and Wilcox boiler with superheater); (*b*) a Marshall steam engine with condenser; (*c*) a compound steam launch engine; (*d*) a motor Belliss air compressor; (*e*) a smaller Broom and Wade compressor; (*f*) a Pelton wheel coupled to a 2 K.W. dynamo and also fitted with a water cooled pulley for brake tests; (*g*) a mixed flow turbine of Francis type, fitted with water cooled pulley for brake tests. Two belt-driven centrifugal pumps supply water to it under heads up to 50-ft.; (*h*) a Drysdale centrifugal pump, direct coupled to a D.C. motor, which has been fitted with a brake pulley for preliminary B.H.P. Test; (*i*) "Venturi" meter, fitted to 3-in. pipe capable of recording up to 160 gallons per minute; (*j*) a vertical tank, fitted with gauger glass and carrying on one side a variety of interchangeable orifice plates; (*k*) a large circular tank with central orifice, for showing the form and action of the free spiral vortex; (*l*) a whirling table, driven by a rope



Hongkong University, the Workshop

(In the University workshop the engineering students become familiar with machine tools and workshop practice. The whole of the repair work for the University engineering, medical and other departments and also for the residential quarters is carried out in the workshops)

from the brake pulley of the Pelton wheel, and carrying a glass cylinder in which the form of action of the forced vortex can be studied; (*m*) a set of iron, brass and glass tubes, for experiment on critical velocities and viscons and turbulent flow; (*n*) a Barker's mill with 4 orifices, working under a head of 3-ft; (*o*) an outward-flow reaction turbine of simple form, working under a head of 3-ft.; (*p*) apparatus for experiments on disc friction; (*q*) a mechanical model of a trochoidal wave and (*r*) apparatus for experiment on the impact of jets upon plane and recurved vanes.



Hongkong University, the Steam Engine Laboratory
(Engineering students are here seen testing a small steam engine. This practical work is a feature of their training)

Mention should be made of the fact that, by the courtesy of the public works department of the colony, the engineering students are able to conduct tests on two large triple-expansion pumping engines and cylindrical boilers used at a neighboring government pumping station.

In connection with the prime movers work there are two ice machines one CO^2 and the other NH^3 each of about 300-lb. of ice capacity. These are tested by the students in the usual manner.

There is also a model paper-making plant which causes great interest and was especially designed, built and presented by Messrs. Bertrams, Ltd., of Edinburgh. Paper from rice straw, rags and other materials has been made with this machine.

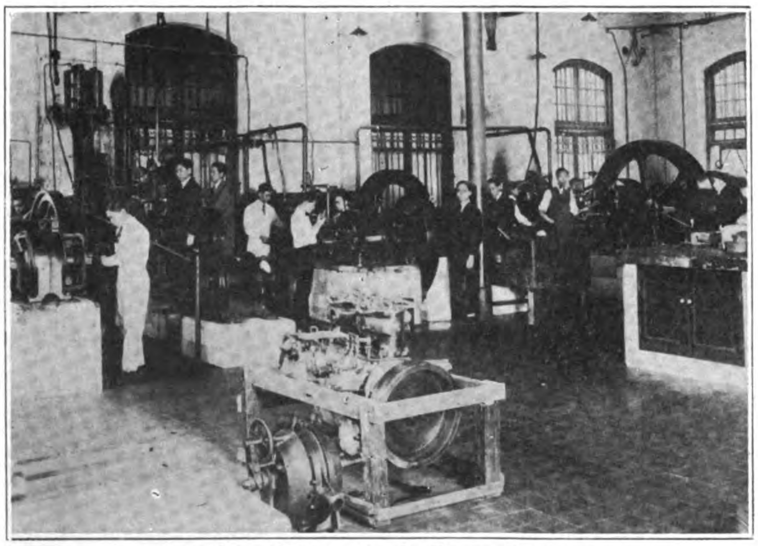
There are a number of models of turbines, engine machine parts in this room containing the paper-making machine.

Adjacent to this room is the junior drawing office where the engineering students of the first and second year receive instruction in geometrical and machine drawing. This is always open and students may often be seen there at work in the evening at their own initiative.

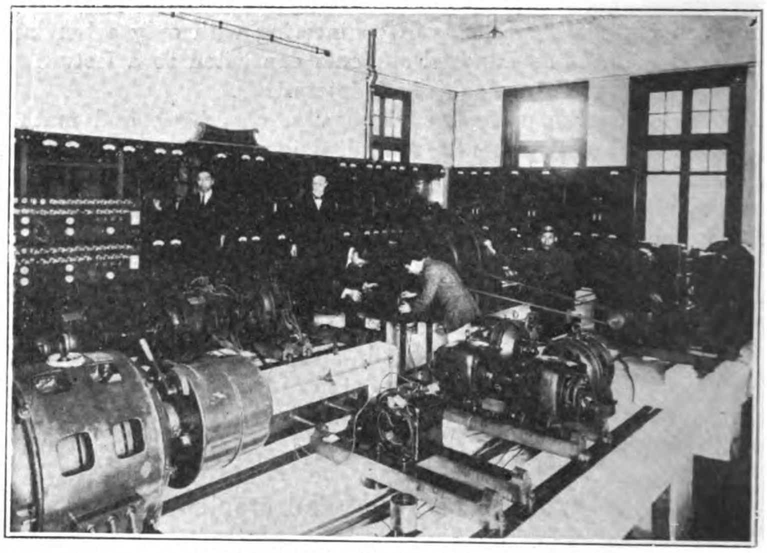
The electrical laboratories consist of (1) electrical machinery laboratory; (2) electrical technical laboratory; (3) photometric room.

The electrical machinery laboratory is adjacent to the power station and occupies a floor space of 41-ft. by 29-ft.

The equipment consists of (1) Vickers Balareer set consisting of two 110 volt 4 pole shunt wound machines of 7 K.W. capacity each; (2) Vickers motor generator set consisting of (*a*) 110 volts 4 poles shunt motor of 13½ H.P.; (*b*) 220 volt three wire generator of 9 K.W. capacity with static balancer; (3) B.T.H. rotary converter with exciter: D.C. Voltage 220, AC 2 or 3-phase at 50 cycles capacity 7 K.W.; (4) E.C.C. D.C. compound generator, 2 poles, 110 volts, 8.5 K.W. capacity; (5) motor generator set consisting of (*a*) 10 H.P. 110 volt, 50-cycle Bruce Peebles 3-phase induction motor coupled to (*b*) Mawdsley 110 volt 2 pole shunt wound D.C. generator of 10 K.W. capacity; (6) motor generator set consisting of (*a*) 10 H.P. 110 volt, 50 cycle Mather and Platt 3-phase induction motor coupled to (*b*) Mather and Platt 110 volt 4 pole shunt wound D.C. generator, fitted with interpoles and of 7 K.W. capacity; (7) a Vicker's shunt motor 110 volts, 5 H.P.; (8) Brush 3-phase 50-cycle induction motor 5 H.P.; (9) Crypto single-phase 75-cycle induction motor 5 H.P.; (10) Mather and Platt 2-phase 50-cycle induction motor; (11) Brook single-phase 50-cycle induction motor 3 H.P.; (12) Crypto single-phase 75-cycle repulsion motor, 3 H.P.; (13) Mawdsley 480 volt D.C. shunt motor 3 H.P.; (14) Mather and Platt booster, 90 amps, 0-50 volts.; (15) Rhodes A.C. motor, repulsion-induction type 1 H.P.; (16) B.T.H. 110 volts shunt motor 1 H.P.; (17) B.T.H. 110 volts series motor 1 H.P.; (18) crypto motor generator set consisting of (*a*) 110 volt 75-cycle single-phase induction motor driving (*b*) 30 volt 10 amp. D. C. generator; (19) static transformers of various ratios and capacities.



Hongkong University, the Power Station
(This laboratory is not only used for testing the various heat engine but heat engine is also the electrical generating station for power supply for the University. Every evening, from about 6 p.m. to 11 p.m., four or five engines are at work and day and night there is always one or more prime movers supplying power)



Hongkong University, the Electrical Machinery Laboratory
(In this laboratory the engineering students make tests on the various direct and alternating current machines)

The machines are connected to a 22 panel experimental switch board, fitted with starters, rheostat, etc., and two pairs of bustars, main and experimental, arranged so that current can be taken from the power station feeders.

The electrical technology laboratory is in the basement of the university and occupies a floor space of 38-ft. by 29-ft. It is equipped for experiments which need comparatively small currents and it is used by the third year engineering students.

In this basement is a full-size tramcar presented by Messrs. Dick, Kerr & Co., Ltd., with motors, controllers, etc., complete.

The rest of the basement—which is airy and well lighted—is devoted to strength of materials and applied mechanics.

The strength of materials laboratory is fully equipped for the scientific investigation of the phenomena of elasticity and for commercial testing of material of construction. The laboratory occupied 2 rooms, the smaller being devoted to the elementary experimental work and to extensometer measurement.

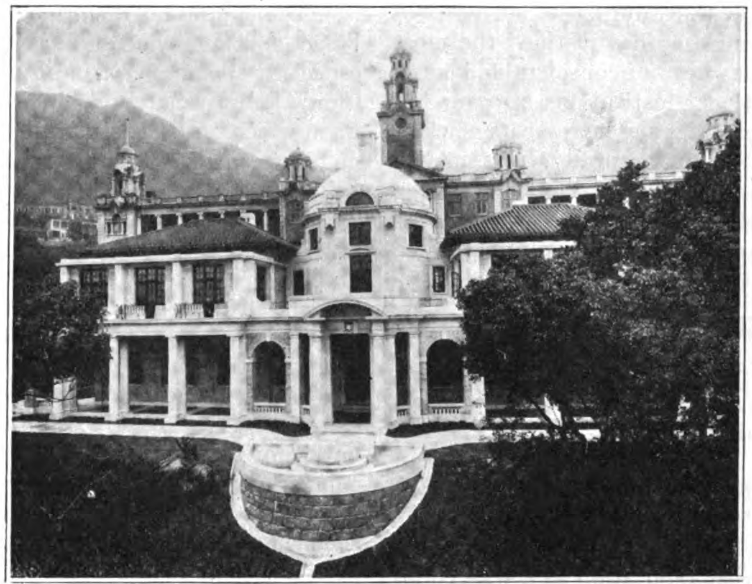
The larger room contains: (1) A 30-ton Buckton testing machine operated by a Vicker's motor. The controller of this motor allows the straining screw to be operated at any speed within the practical limits; (2) an Avery torsion machine, land operated of maximum capacity of 10,000-inch lbs.; (3) a 1,000-lb. Denison wire testing machine.

The other machine room contains: (1) A 4-ton Avery testing machine; (2) a Bailey cement tester; (3) an Avery cement tester; (4) a Sankey metal bending tester; (5) an alternating stress machine (torsion); (6) a 1-ton testing machine by the Cambridge Scientific Instrument Co. for use with the Ewing extensometer; (7) a 1-ton testing machine by Messrs. Pye for use with the Granter extensometer; (8) apparatus for the study of the flexure of beams; (9) microphotographic apparatus for study of the structure of material.

The applied mechanics laboratory is well equipped with apparatus for about 20 experiments.

The senior drawing office is on the top floor of the university and is a room of area 40-ft. by 30-ft. It is used by the third and fourth year students.

Mention should be made of the physics and chemistry laboratories which are airy and well equipped. They are used by the first and second year engineers.



Hongkong University, Students' Union Buildings

(This building contains reading rooms, a debating hall, billiard room and a refreshment room and is available for all the University students for recreation purposes)

A valuable portion of the student's training is the visits to works, which take place at regular intervals.

Social Life

There is a most active university engineering society which arranges these visits and meetings at which local engineers, visitors and others give addresses of a technical nature.

The students' union building is probably one of the most beautiful buildings in the Far East. It stands on an area of 122 by 42 and consists mainly of four rooms and an entrance loggies. The four rooms are billiard room, a lounge, and they are all beautifully furnished. Concerts are also held in the great hall and the social life of the students at the university is carefully planned so as to provide them with reasonable recreations.

There is a fair sized athletic ground behind the main building of the university of area 100-ft. by 120-ft. The large recreation ground within about ten minutes of the university is of area sufficient for cricket matches. It is distant about a quarter of a mile from the main building on a most beautiful site.

The importance of a healthy social and athletic life for the student is fully recognized by the university authorities. That is one of the chief reasons for having all the students in residence in the university hostels.

There are five "halls or hostels" in which students live. They are respectively named, Lugard, Eliot, May, Morrison and St. John's Hall, and are all attached to or in the grounds of the university.

The area of the grounds (including buildings) of the university is about 1,000,000, sq. ft. The site is on a hill-side, and varies in level from about 200-ft. above sea level to about 450-ft.

Past Records

It should be explained that, in order that there should be no question as to the standard of the engineering degree, the work of these students has been sent to assessors in London who are examiners of the University of London and these assessors have always certified that the standard reached by the candidates from Hongkong has been equivalent to that required for a corresponding degree of the University of London. The following are engineering graduates who obtained honours degrees in engineering in the university:—

First Class Honours: Fu Ping-sheung (1916); Liu Chen-hua (1918); Chien Hung-van (1919); Sung Zau-yoen (1920); Chun Wing-ching (1920).

Second Class Honours: Tang Ying-lam (1916); Leung Nai-hang (1916); Iu Tak-cheung (1917); Lai Hau-chin (1917); Lee Iu-cheong (1917); John Moraes (1917); Wong Zung-kwei (1918); Wong Zung-yu (1918); Shih Ying-ching (1918); Lim Bang-in (1918); Lee Boon-hock (1918); Cheah Sin-bee (1918); Yao Kwang-yu (1918); Hu Kwok-leung (1919); Chau Iu-nin (1920); Lui Sun-lu (1920); Yang Ssu-chien (1921) and Chiu Kwan-tze (1921).

Concerning the employment of these engineering graduates we understand that as close a record has been kept as is possible. A number have gone abroad in order to obtain further practical experience or in order to do post-graduate work. Some are employed on railways, in engineer's and architect's offices, or in commercial organizations; while others have commenced work on their own account.

Constitution

It should be made quite clear that the University of Hongkong is not a government institution, although the university authorities would be first to acknowledge the sympathy and the assistance with the local government has always extended to it. That has been the consistent policy of the Hongkong government towards education almost from the very beginning of the history of the colony in 1841. The governor, as chancellor, is the official head of the university, but the chief executive officer is the vice-chancellor, who devotes his whole service to the administrative work of the university. Sir Charles Eliot, K.C.M.G., LL.D., at present British ambassador at Tokyo, was the first vice-chancellor, and acted in that capacity for nearly six years. His fame as a scholar is too world-wide to need comment. The present vice-chancellor is Sir William Brunyate, K.C.M.G., a distinguished graduate of the University of Cambridge, and for years legal and financial adviser to the government of Egypt. Sir William is now well known in educational circles in China and last year visited Peking, Hankow, Shanghai, Singapore, Penang and Java in order to consult with those interested in education.

The supreme governing body of the university is the court, consisting of about sixty members, many of whom are Chinese and there are also Parsees. There are a number of local *taipans* and prominent commercial men in the colony and in the Far East, generally have identified themselves with the work and well-being of the university. The executive body is the council, which might almost be called a committee of the court. There is a strong finance committee, including, *ex-officio*, the chief manager of the Hongkong and Shanghai Bank.

In academic matters the senate functions and there are boards of faculties to consider matters of special importance to the particular students concerned such as examinations, etc.

There are at present about 260 students, nearly all in residence. There is no reason why the numbers should not increase considerably in the near future if the schools in China can prepare candidates successfully for the entrance examination. As we have already stated, there is room at the university for 500 or more students and, with no very great extensions, the number might easily exceed 1,000 students.

Enough has been written to show that, during its ten years of active service, the University of Hongkong has justified the most sanguine hopes of its founders and has been of considerable benefit to China. In common with educational institutions all over the world it is always able to extend its activities and increase its efficiency if further funds are available. We are, naturally, particularly interested in the development of the engineering faculty and we commend its needs to those who believe that by the development of her vast natural resources China will take her rightful place in the world.

The Vice-Chancellor and Staff

The University has been fortunate in securing the services of a very distinguished scholar and administrator as vice-chancellor and principal. Sir William Edwin Brunyate, M.A., K.C.M.G., has been in the Far East for rather more than a year and has already made many friends in places as far apart as Peking, Hankow, Shanghai and Penang. Before accepting the appointment as chief executive officer of the University of Hongkong, Sir William Brunyate had made a great reputation as a wise counsellor and able administrator in Egypt.

Sir William Brunyate was born in 1867. His University reputation was made in Cambridge University, England, for he graduated under brilliant circumstances. In 1888, he was second wrangler; in 1889, his name appeared in the first division, first class, second part of mathematical tripos and in 1890 he became famous as Smith's prizeman. During the same year, he was the president of the Cambridge Union Debating Society. From 1890-96, he was a fellow of Trinity College, Cambridge, and he was called to the bar at Lincoln's Inn in 1894. He entered the Egyptian government in 1898 and in that service he obtained many honours and acted both as legal advisor and also financial advisor to the Egyptian government. It may be of interest to record that before going to Egypt, Sir William Brunyate acted as professor of mathematics for a year in one of the Australian Universities while the occupant of the chair was on leave. So that, in returning to academic life, Sir William was really going back to work not altogether strange to him.

The first vice-chancellor of the University of Hongkong was Sir Charles Eliot, K.C.M.G., who is now British Ambassador in Tokyo. Sir Charles Eliot was famous for his remarkable academic and diplomatic career. It has often been stated that he is able to converse fluently in twenty-seven languages.

The officers of the University are as follows :

Chancellor : His Excellency Sir Reginald Stubbs, K.C.M.G.
Vice-Chancellor : Sir William Brunyate, K.C.M.G.
Deans : K. H. Digby, M.B., B.S., F.R.C.S. (Faculty of Medicine)
C. A. Middleton Smith, M.SC., M.I. (Mech.) E. (Faculty of Engineering)
W. Brown, B.SC., M.A. (Faculty of Arts)
Registrar : N. Teesdale Mackintosh, M.A. (Oxon)

Modern Scientific Enterprise

It is a very frequent occurrence to hear of some new scientific discovery. Modern medical science advances every day, and in Europe analytical laboratories have been established in order to use these discoveries for the benefit of mankind. In these laboratories some of the world's cleverest scientists are showing what can be done by a practical application of analytical methods.

China is a far cry from Europe, and it would seem that these modern methods are not for her, but a laboratory, fitted with the most up-to-date instruments and apparatus, has been opened at 16 Canton Road, Shanghai, by a man who has made the thorough study of this branch of medical science, his profession.

More and more of late years, has the medical profession been impressed by the fact that a clinical application of this science is not merely worth while, but necessary in modern medicine, and this laboratory, though principally working for and with the profession, does welcome patients for private diagnosis. It ought thus to be of great service to people in the Far East.

The symptoms of most diseases may be found in liquids, e.g., blood, sputum, urine and also in the feces ; tests of the last-named especially being very important. Parasitical diseases flourish in China, and for many of these there are no characteristic symptoms upon which to base a clinical diagnosis. Possibly only after years of treatment for dysentery, gastritis, enteritis, etc., may the realization that it is some other disease, force itself upon the sufferer. These parasitical diseases, though often mild in character, sometimes give rise to grave secondary bacterial affections, of which an early diagnosis is imperative. But some parasitical diseases, such as amœbic dysentery, follow a bacterial disorder, and immediate knowledge of the cause of such disease is necessary, in order that a special treatment may be commenced, as there are many forms of dysentery, each of which needs a different remedy. The analytical tests obviate the possibility of mistakes when determining the nature of these diseases.

Take for instance, malaria ; in the sub-acute and chronic forms there are no clinical characteristics. Some symptoms, such as enlargement of the spleen, gastro-intestinal disturbances, anæmia, etc., are also common to non-malarial affections, but when the blood analysis is used there is no likelihood of a mistaken diagnosis.

The blood is the most sensitive liquid known, if a foreign element is present in the body, the blood immediately sets up a counteracting ferment. This theory underlies Professor Abderhalden's reactions, which have been latterly improved upon to such an extent, that an analysis of the blood will show with certainty whether any foreign growth is malignant (cancer) or not. Again, in the case of cancer, it seems highly recommendable to have an analysis made a few weeks after the operation, to prove whether it has been possible to remove all of the malignant body, or whether a particle left has started a new growth. The head of the institute is particularly familiar with these tests, having only returned from working with Professor Abderhalden.

From the foregoing it will be seen that familiarity with analytical chemistry is of great importance to modern scientists, and more especially so in the Far East, where diseases such as have been mentioned, are very prevalent, as the analytical method disposes of the possibilities of mistakes when determining the exact nature of various diseases. The establishment of this Bakteriolog.-Serolog. Institut must therefore be regarded with great satisfaction by public of China.

China's Window-Glass Imports

The curve of China's consumption of window glass indicates a growing demand for the substitution of glass for paper windows. The pre-war year of 1913 marked a 50 per cent. increase in consumption over 1912, and had the war not intervened China's present consumption of window glass would no doubt be much greater.

The Superstructure of the Netherlands India State Railways

By H. L. Slinkers, Chief Engineer at the Construction and Bridge Department of the State Rail and Tramways in Netherlands India

1. *Length and Gauge of Lines in Exploitation.*—According to the law of April 6, 1875, the construction of the state railways in Java was started, for which a normal gauge of 1067 m.m. was chosen. Nearly three years later (May 16, 1878) the first line could be opened for public traffic. This was the line Sourabaya-Pasoeroean of a length of 63 K.M. After this, continuously was worked at the extension of the system, and, at the same time, tramways of narrow gauge (600 m.m.) were laid down. Moreover, some lines, not built by the S.R. were taken over, under more tramlines of 750 m.m. gauge, so that in 1920 there were in exploitation:

Java	Gauge	1067 m.m.	2510 K.M.
,, ...	,,	600 ,,	119 ,,
South Sumatra	,,	1067 ,,	229 ,,
West ,, ...	,,	1067 ,,	245 ,,
North ,, ...	,,	750 ,,	515 ,,
		Total ..	3618 K.M.

In this table is not included the line Solo-Djocja (60 K.M.) which line the S.R. has in common use with the N. I. Railway Company. Last named company is owner of this line, and has constructed it in broad gauge (1435 m.m.) For use by the S.R. a third rail has been added.

Railways and tramways in N. I. exist only on the islands of Java, Sumatra and Madura. In Celebes a state-tramway is in course of construction.

The S.R. have principally single track. At the end of 1919 the total length of double, triple and quadruple track only attained a length of nearly 30 K.M.

However, the doubling of the track is being carried out vigorously at the most important line sections. On the following lines the track will be doubled, a greater part of which is now completed:—

Meester-Cornelis-Tjikampek	72 K.M.
Wonokromo-Krian	21 ,,
Krian-Kertosono	58.5 ,,
Padalarang-Bandoeng	14.5 ,,
Total ..	166. K.M.

2. *Subdivision of the System.* (*a*) *According to Exploitation.*—The government has fixed three "General Regulations" according to which the railways and tramways in N. I. are managed as primary, secondary railways or as tramways. According to this subdivision there are in exploitation:

Primary Railways Java	1523 K.M.
Secondary ,, ,, ...	752 ,,
Tramways (1067 m.m.) ,, ...	235 ,,
,, (600 m.m.) ,, ...	119 ,,
Secondary railways, W. Sumatra	245 ,,
Tramways (1067 m.m.), S. Sumatra	229 ,,
,, (750 m.m.), N. Sumatra	515 ,,
Total ..	3618 K.M.

The loading-gauge, fixed by the General Regulations has the same dimensions for secondary railways and tramways of 1067 m.m. gauge, i.e., max. width 3.20 m., max. height above top of rail 3.85 m. For primary railways and narrow gauge tramways another profile has been determined upon. For the prim. railways the max. width is fixed at 3.70 m., max. height at 3.85 m. For tramways of 600 m.m. gauge: max. width 2.70 m., max. height 3.40 m.

Besides the loading-gauge, the prescribed max. speed is characteristic. This max. speed amounts to:

75 K.M. an hour for prim. R.R.
45 ,, ,, ,, ,, sec. ,,
30 ,, ,, ,, ,, tramways.

These speeds, however, have been increased by different revolutions for particular line-sections, with which the max. speeds given in sub 2*b* are connected.

It is intended to make the trip Weltevreden-Cheribon-Kroja-Soerabaya possible in one day (822 K.M.), so that on the level sections of this line (only 57 K.M. is through mountainous country) a speed of 100 K.M./hour may be attained. Until now this speed has been attained only on trial-runs. For the time being the maximum speed is 75 K.M./hour.

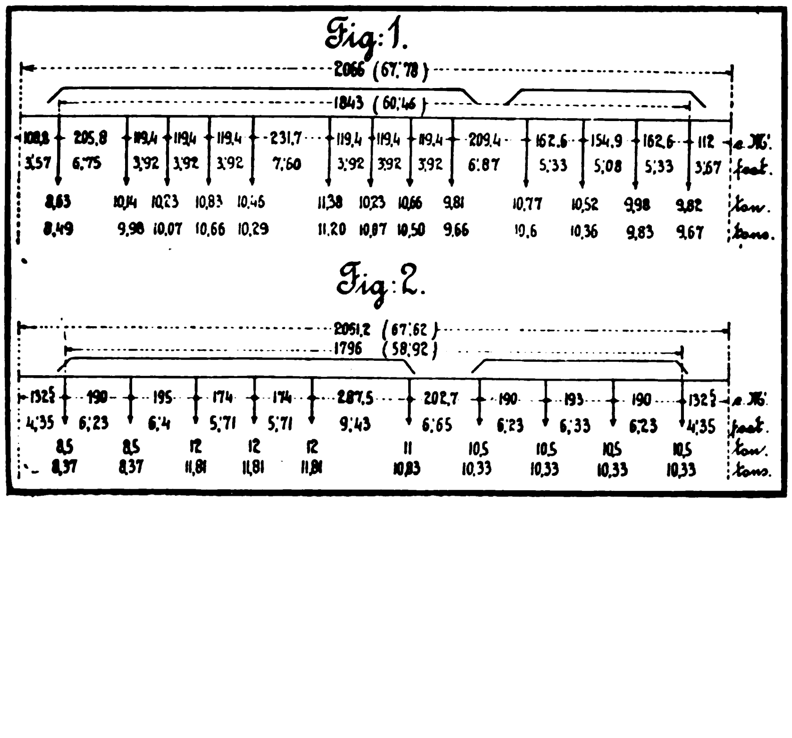
(*b*) *According to Speed and Construction.*—In connection with the greatest allowable speed, the S.R. has divided its normal lines in Java into the following sections:—

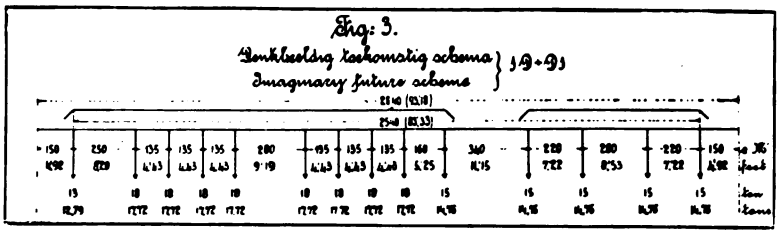
Section	A^1	level lines max. speed	100	K.M./hour	— 689 K.M.
,,	A^2	,, ,, ,, ,,	75	,, ,,	— 404 ,,
,,	B^1	mount. ,, ,, ,,	65	,, ,,	— 57 ,,
,,	B^2	level ,, ,, ,,	60	,, ,,	— 82 ,,
,,	B^2	mount. ,, ,, ,,	50	,, ,,	— 198 ,,
,,	C	level ,, ,, ,,	50	,, ,,	— 321 ,,
,,	C	mount. ,, ,, ,,	45	,, ,,	— 524 ,,
,,	D	lines ,, ,,	40	,, ,,	— 235 ,,
				Total ..	2510 K.M.

By this subdivision the construction of the railroad also is fixed.

3. *Largest Locomotives and Axle-loads.*—The largest and heaviest locomotives of the S. R., which at the same time show the greatest axle-load and cause the greatest rail-stresses are: on the level-lines: the 2—C—1: 4 cylinder compound locomotives with four-axle tender. Total weight 106 tons, max. axle-load 12 tons.

On the mountain-lines: the 1—D—D (2—8—8—0) locomotives with four-axle tender. Total weight 133.46 tons, max. axle-load 11.38 tons.





Construction of Superstructure

4. *General Remarks.*—Dr. J. A. H. Haarman, chief engineer of the department of construction and bridges of the S. R., has had an important share in the construction of the superstructure. By him, in 1908, the track of 1067 m.m. was submitted to a calculation, the results of which have been compared with the 1435 m.m. gauge, used in Europe.

Two studies were published by him, viz. :

(*a*) " Beschouwingen over den bovenbouw van het spoor met wijdte van 1067 m.m., in het bijzonder van dat der Staatsspoorwegen op Java." Ed. of the Javasche Boekh. en Drukkerji, Batavia 1908.

(*b*) " Raillasschen, Ene aanvulling der berekeningswijze van Dr. H. Zimmermann en een pleidooi voor de lasch met uitkragende steunlaschplaten." Ed. as *a*.

In consequence of the study sub *a*, based on the theory of Zimmermann, the construction of the track with the rail No. 2 (weight 25·75 K.G./M.) as introduced in 1900, was abandoned, as being less suitable, and in 1909 was proceeded to use rail No. 3 (weight 33·4 K.G./M.), with joint-construction and sleeper-space as mentioned in the work of Mr. Haarman and further described sub. 14.

In the study sub *b* quite new views were given about the effect of long fish-plates. The use of long fish-plates not always appears to secure smooth running, and therefore a new system has been recommended, about which more will be said sub. 14.

Now we proceed to more detailed description of the track.

The Rails

5. *Types of Rail of the S.R.*—The following types of rail are used by the S.R. on the through lines :—

Weight K.G./M.	Information	Location		Length K.M.
40.05	Tunnel near S. Loento	West Sumatra		0.8
33.4	Rail No. 3	Java		972.0
27.02	,, 1	Java (Bangil-Malang)		49.0
25.75	,, 2	Java	1418.0	
,,	,, 2	S. Sumatra (Lampong line)	77.0	
,,	,, 2	W. Sumatra	244.2	
,,	,, 2	N. Sumatra (Atjeh)	43.5	
			———	1782.7
25.75 à 29.76	Partly rail No. 2	S. Sumatra (Palembang line)		152.0
25.4	Iron rail	N. Sumatra (Atjeh)		4.5
20.8 à 21.1		Java (Babat-Djombang)		71.0
16.4	Gauge 750 m.m.	N. Sumatra (Atjeh)		467.0
11.2 à 14.88	,, 600 m.m.	Java		119.0
			Total...	3618.0

From this table appears that principally two types of rails are used, i.e., No. 2 and No. 3. In March, 1919, it was determined to use a heavier section of 45 to 46 K.G./M. and to use this type, i.a., on sections, where replacing rail No. 2 by a heavier one will be necessary. Rail No. 2 continues for section railways and tramways.

It still forms a point of consideration, if for the new railsection will be chosen the Prussian profile No. 15 or the Dutch normal profile No. 46. In this question the cost of procuring will give the decision. Last named profile belongs to the series of normal sections projected by a Netherl. rail-commission, and fixed in the assembly of the section for railway construction and exploitation of the institute of (Dutch) engineers held on Oct. 18, 1916. The principal dimensions of both profiles, with those of Nos. 2 and 3, will be found in next table ; further the profiles Nos. 2, 3 and NP 46 are represented in Figs. 4, 5 and 6.

Definition	Rail No. 2	Rail No. 3	Prussian No. 15	Dutch NP 46
Weight in K.G./M.	25.75	33.4	45.05	46.23
Height m.m.	110.—	134.—	144.—	142.—
Width of base m.m.	90.—	105.—	110.—	120.—
Width of top m.m.	53.—	58.—	72.—	72.—
Tickness of web m.m.	10.—	11.—	14.—	14.—
Max. moment of inertia in $c.m.^4$ ...	538.3	1036.6	1582.9	1640.—
Min. moment of inertia in $c.m.^4$ ...	88.9	150.7	259.1	310.—
Max. moment of resistance $c.m.^3$ ...	97.4	154.0	216.8	231.—
Min. moment of resistance $c.m.^3$ ...	19.8	28.7	47.1	51.67

6. *The Elevation of the Outer Rail in Curves.* (*a*) *For the Sections A_2—B_2—C and D.*—This is fixed by the well-known formula:

$$h = \frac{V^2 \; s.}{R. \; g.} \text{ where:}$$

h=elevation in m., s=distance c. t. c. of railtop=nearly the gauge in m.

V=speed in m./sec., R=radius of curve in m., g=accel. of gravitation in m./sec.

However, in view of the slower trains, for V not the max. speed of the section is taken, but a smaller one. By various considerations in connection with the number and speed of trains, for V are taken the speeds of 14—12—10 and 8 M. per sec. for the above-named track-sections. It appears that the elevations thus arrived at, are about half of what should be obtained, when for V had been taken the max. speed of the section.

Elevations less than 0.02 metre are not practised.

b. For the Sections A^1.—In view of the great speed (100 K.M./hr) which on these sections will be applied, another method of calculation has been followed. Departed was from the greatest speed admitted in curves on the European gauge of 1435 m.m. This speed is considered to be allowable on the gauge of 1067 m.m.

R. in Metres	900 and more	800	700	600	500	400	300
Max. speed in K.M./hour	100	95	90	85	80	75	56
Max. speed in M./sec.	27.8	26.4	25.0	23.6	22.3	20.9	18.1

This table is taken from the Eisenbahn-Bau und Betriebs-Ordnung of the German empire, although without increasing the speed to more than 100 K.M.

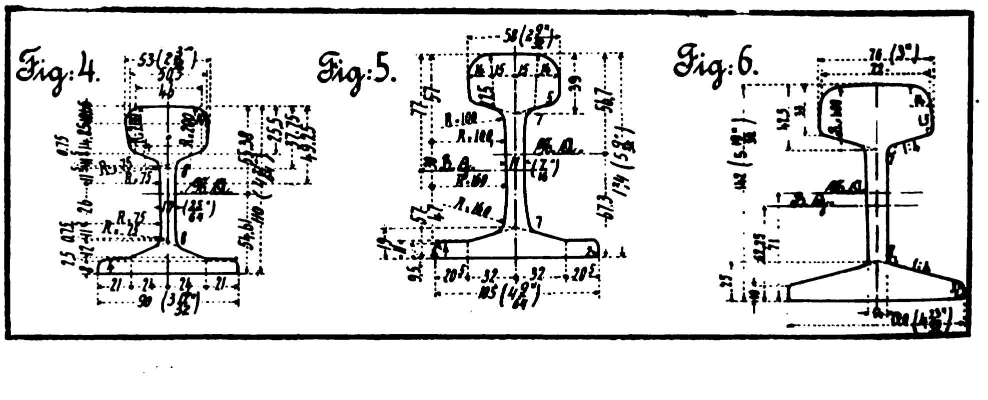
Putting in the above-mentioned speed for V, the elevation of the outer rail is fixed by the formula :

$$h = \frac{V^2 \; s.}{R. \; g.} = 0{\cdot}03$$

in which formula the letters have the meaning already mentioned. The line of thought has been the following :—

Taking into account the slow trains, the amount should be fixed with which the theoretical elevation, necessary for the max. speed, should be diminished. From tests taken by Bräuning* it appeared that the theoretically necessary elevation may be diminished or increased by 1/50 to 1/20 of the gauge, without causing trouble to passengers.

* See Handbuch der Ingenieurs. Wissenschaften," page 139, second Edition, 5th part, 1st vol.



This is equivalent to 1067/50 to 1067/20 or nearly 0·02 to 0·05 m. An average of 0·03 was then chosen. Thus, after rounding off to 5 m.m. the next table was got at, wherein for R=2000 and 3000 m. also the smallest elevation of 20 m.m. was applied.

R in Metres	3000	2000	1500	1200	1000	900	800	700	600	500	400	300
Elev. h in m.m.	20	20	25	40	55	60	65	65	70	80	90	908

c. *For the Sections B^1.*—For the sections B^1 the same elevations are used in curves of the same radius as calculated for A^1.

7. *The Transition-curves.*—The transition-curves have the shape of the generally used cubic parabola, according to the formula

$$y = \frac{x^3}{\text{constant}}$$

For the sections A^2—B^2—C and D the constant has for all curves the following values respectively 76824—56442—39196 and 16742 :—

For the sections A^1 the constant=6000 Rh.
" " " B^1 " " =3600 Rh.

8. *The Increase of Gauge in Curves.*—The increase of gauge in curves of 150—200—250—300 and 400 m. radius respectively amounts to 20—15—10—5 and 5 m.m. In curves of 500 m. radius and more, no increase is applied.

9. *Rails on Bridges and Open Water-passages.*—On the bridges the largest distance between sleepers is not more than the max. distance admitted on the section.

At the transition to the bridge, care is taken to decrease the sleeper-distance of the last three sleepers on the abutment to 60 c.m., and is the distance between the last sleeper on the abutment and the first one on the bridge as small as possible (max. 70 c.m.)

At open water-passages, the width of the passage is 70 c.m., so that the distance of the supporting points is larger than the distance of the sleepers on the roadbed. Therefore the rail often is reinforced by a longitudinal wooden sleeper.

10. *Testing Requirements of the Rails.*—The material of the rails is ingot-steel with a tensile strength of 60-70 K.G./m.m^2, and an elongation of resp. 11.5 to 14 per cent. Rails of chrom-nickel steel are not yet in use.

The chemical composition must satisfy the following conditions: Carbon at the utmost 0.55 per cent. sulphur max. 0.06 per cent., and phosphor max. 0.10 per cent.

Further the rail has to satisfy to falling tests, etc., about which nothing more will be said.

11. *Distortion of Rails. (a) By Temperature-variations.*—The change in length is made possible by the clearance between the ends of the rails. This clearance, when not directly exposed to the heat of the sun, should amount to 5—6—7— and 7 m.m. respectively for the normal length of 6·80—10·20—11·90—13·60 metres. The nuts of the fish-bolts are fastened with a washer of a specially fixed length, so as to avoid too intense fastening, and to secure a free expansion in the joint.

The loosening of the nuts is prevented by safety-appliances i.a. by using spring washers between nut and fish-plate, or by using the so-called large nuts, which are not secured (see Fig. 12). These large nuts at the underside are turned concave, so that only the circumference bears on the fish-plate. In this manner a great moment of friction prevents loosening.

b. *By Wear of the Rails.*—Rails that are used up to a loss in weight of 12 per cent., or to an extent, that in curves, the wheels touch the fish-plates of the outer rail, are replaced.

c. *By Over-loading.*—On some sections, f.i. on the line Poerwakarta-Padalarang, where the rail No. 2 is heavily loaded (see sub 12) were observed alternately bright and dark spots. Originally it was thought this was caused by the well-known undulating wear of the rails.

However, after some measurements, it soon became clear that these phenomena was to be explained by over-loading, to which the rails in question were subjected. The rails show a wave-like surface, caused by permanent distortion. The lower points occur nearly in the middle between two sleepers, the higher ones not quite above the sleepers, but somewhat besides of these. The observations on this question are still being continued.

The Joints of the Rails

14. *Description of the Different Models.*—The different types are to be distinguished according to the year of prescription.

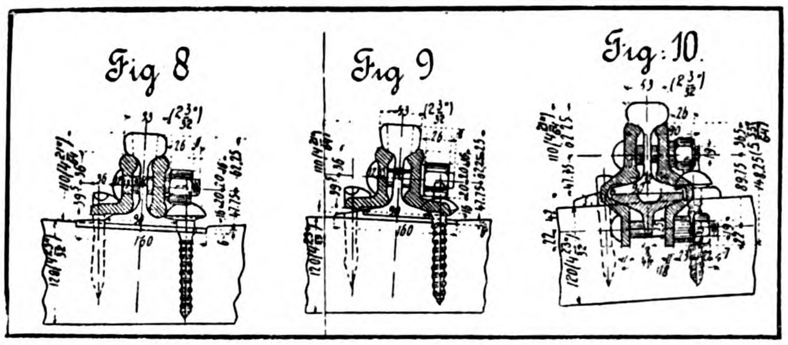


Fig 8 Fig 9 Fig: 10.

Model 1875 (see Fig. 8). The original construction exists of a flat inner- and an angle-formed outer fish-plate. When the traffic increased, the joint construction was found to be too weak, there aroused deflections in the track the so-called cat-backs.

Model 1895 (see Fig. 9). When in 1895 reinforcing the permanent way was thought to be urgent, and the length of the rails was changed from 6.80 to 10.20 metres the joints also were made more solid. For the inner fish-plate also was used an angle-formed one.

Model 1900 (see Fig. 10). Both angle-fish-plates were replaced by wing-fish-plates. Between these two fish-plates, under the foot

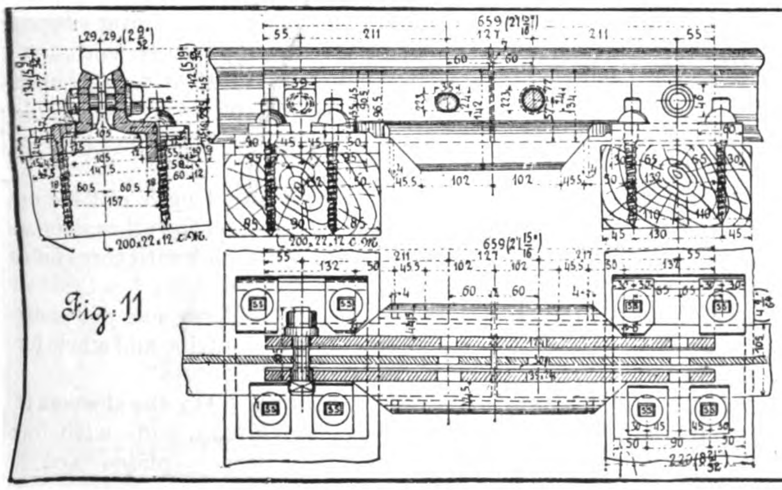


Fig: 11

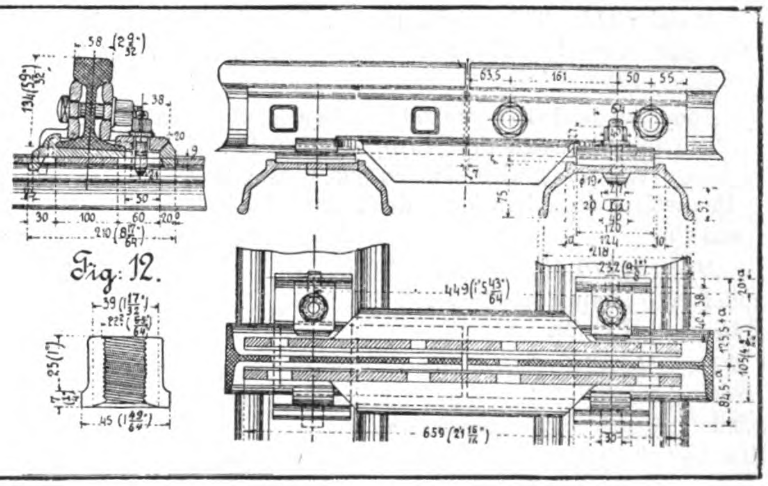


Fig: 12.

of the rail, is fitted a T-piece, jammed by long coupling bolts between the fish-plates. In this manner it was supposed both the head and the foot of the rail-ends should be rigidly fixed, so that the profile of the rail was united as complete as possible. In practice, however, it became clear that the T-piece does not join the bottom of the rail. It, the T-piece, shifts when under charge. Further the tightening up of the bolts under the railfoot has the consequence, that the fish-plates above the railfoot give away to the outside, so that the rail-heads are less sufficiently joined. The wing-fish-plates also have a too complicated shape, so that the true moment of inertia will appear to be much smaller than the theoretical one.

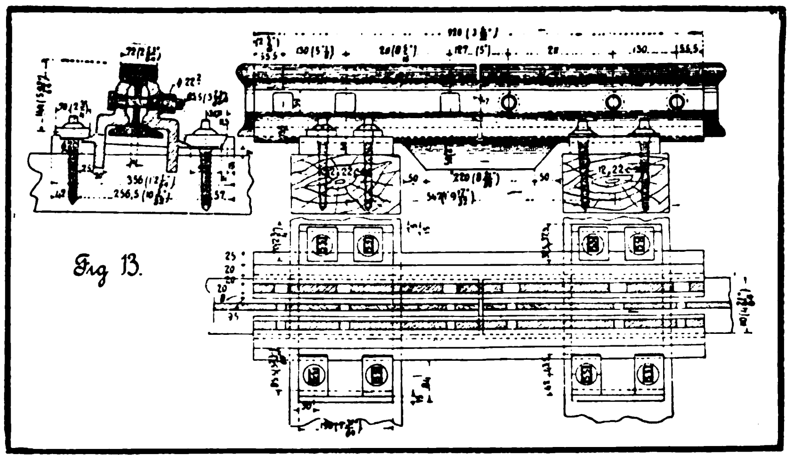
Finally it was observed that the fish-plates cracked at the point where the reinforcing commenced. The passing over from one profile into the other is too sudden.

The joint is still in use, however, without the T-piece and the coupling bolts at the underside.

Model 1909 and 1910 (see Figs. 11 and 12). In 1909 came into use the heavier rail No. 3. A new construction of the superstructure was projected. Model 1909 is used with wooden sleepers, model 1910 with iron ones.

The fish-plates have a much simpler shape. Although in Europe already long fish-plates with 6 bolts were in use, this was not imitated by the designer, Dr. J. A. H. Haarman, for reasons he gave in his work, mentioned sub 4a. Long fish-plates have the disadvantage of causing jumping of the not-loaded rail-end, on which detail will be said more (see sub " Model 1915 ").

Model 1911. In 1911 also for rail No. 2 a better joint was designed. The fish-plates have the same shape as model 1909. These fish-plates are already ordered, but not yet in use, because the still existing stock of older constructions is still so abundant, that it was resolved to use up these first. In the meantime in 1919 a new joint was designed for rail No. 2, with the same type of fish-plate as model 1915 (see hereunder).



Model 1915. This model projected for rail No. 3, is of the same type as model 1919, represented by Fig. 13 for the Prussian profile No. 15.

About model 1915 some details are already given sub 4.

The joint construction 1915, system Dr. Haarman (named by him " the joint with flanged-out fish-plates "), is the result of theoretical considerations, dealt with in his work, referred to sub 4b.

Model 1919 (see Fig. 13). The same joint-construction as model 1915 is applicated on rail No. 2 and on the new rail-profile of 45 to 46 K.G./M.

15. *Material of Fish-plates.*—The material is ingot-iron of a tensile strength of 40 to 50 K.G./m.M², whilst the product of tensile strength and elongation at the least must amount to 900. Thus the elongation amounts to a minimum of 25 to 18 per cent.

The Sole-plates

16. *Description of Different Models.—From 1875-1889* few sole-plates were used, or not at all. The inclining position of the rail was obtained by adding the sleeper. *From 1889-1900* flat sole-plates were used, 6 m.m. thick, and fixed by dogspikes. With the sole-plates, the sleepers still must be added under the sole-plates.

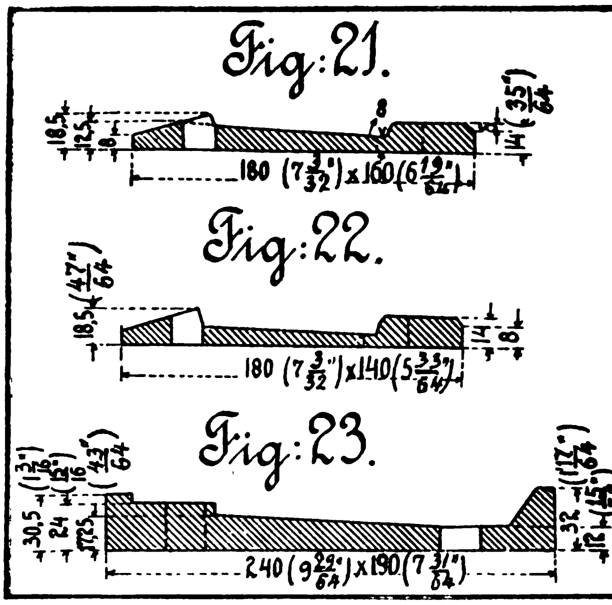
The sole-plates now were applied as follows :

(*a*) On the straight line and in curves of more than 400 metre radius, only on the sleepers at the joints.

(*b*) In curves of 300-400 metre radius moreover a sole-plate was put on the middle sleeper under the outer rail.

(*c*) In curves of a radius of less than 300 metre, a sole-plate is used alternately on the sleepers, but also only under the outer rail.

From 1900 until now, for rail No. 2 are used the models 1900 (see Figs. 21 and 22). From 1900 to 1909 for rail No. 2 the sole-plates were applied alternately, since 1909 on all the sleepers.



The minimum thickness of 6 m.m. is increased to 9 m.m. The sole-plates on the joint sleepers are 18 c.m. long, 16 c.m. wide (Fig. 21) and are fixed by two railscrews at the inside and two dog-spikes at the outside. These plates are also used on the sections A, B and C under the outer rail of curves of 400 metre radius or less.

On the other sleepers the plates are 18 c.m. long, 14 c.m. broad (Fig. 22) and are fixed by a railscrew at the inside and two dog-spikes at the outside.

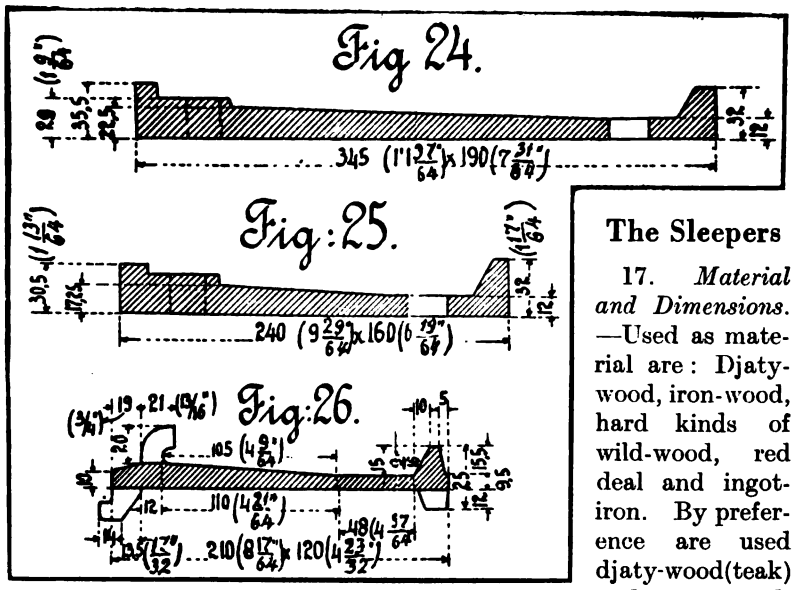
From 1909 until now, for rail No. 3 on wooden sleepers is used model 1909 (Figs. 23 and 25) and model 1915, and on iron sleepers model 1910. About these models the following is to be said :—

Model 1909 (Figs. 23 and 25). When in 1909 a new superstructure was constructed for rail No. 3, of course a heavier sole-plate was also necessary. The sole-plates were then used on all the sleepers.

On the joint sleepers are used plates of a length of 24 c.m., 19 c.m. wide (Fig. 23) with holes for railscrews ; on the other sleepers the plates are 24 c.m. long, 16 c.m. wide (Fig. 25) with three holes for railscrews.

Model 1910 (on iron sleepers, Fig. 26). These sole-plates are 21 c.m. long, 12 c.m. wide with a hook at the outside and a hole for a holding-down bolt at the inside.

Model 1915 (system Haarman, Fig. 24). On the sleepers at the joints are used plates, 34.5 c.m. long, 19 c.m. wide with four holes for railscrews. On the remaining sleepers plates acc. to Fig. 25.



The Sleepers

17. *Material and Dimensions.*—Used as material are: Djaty-wood, iron-wood, hard kinds of wild-wood, red deal and ingot-iron. By preference are used djaty-wood(teak) and iron-wood. Sleepers of red deal are not bought any more, because notwithstanding the use of preservatives, they must be replaced after some two years of service. The normal dimensions of wooden sleepers are: length 2 metre, width 22 c.m., height 12 c.m. Originally, from 1875 to 1900, the length was two metres. In 1900 this was increased to 2.20 m., which length in 1909 again was reduced to 2 m., whilst the number of sleepers per rail-length was increased. Dr. Haarman demonstrated in 1909, that in connection with the stresses, caused in the sleepers, the most economical length for the gauge of 1067 m.m. is 2 metres. It is a better method to decrease the pressure on the ballast by increasing the number of sleepers, than by increasing their length. On bridges the normal dimensions are: length 1.80 m., width 22 c.m., height 18 c.m. The iron sleepers also have a length of 2 m. For the other dimensions see Fig. 12.

18. *The Distribution Under the Rails.*—The distribution under the rails is taken as follows:

From the rail-end the first sleeper lays at a distance of 22 to 27 c.m. The remaining sleepers are distributed regularly under the remaining length of the rail. The greatest sleeper-distance, centre to centre, amounts to: *Under rail No. 2*: On the mainlines on straight track 81 c.m. and in curves of R< 400 m.: 70 c.m. *Under rail No. 3*: On the mainline in the straight track and in all the curves 72 c.m. for wooden, and 73 c.m. for iron sleepers.

It is intended to take the maximum distance between 60 and 65 c.m. for sleepers under the type of rail of circa 45 K.G./M. not yet used for the heaviest loaded tracks.

19. *Switches and Crossings.*—About switches and crossings of the S. R. nothing peculiar can be said. The switches are of the well-known construction, with pivoted, or with spring points.

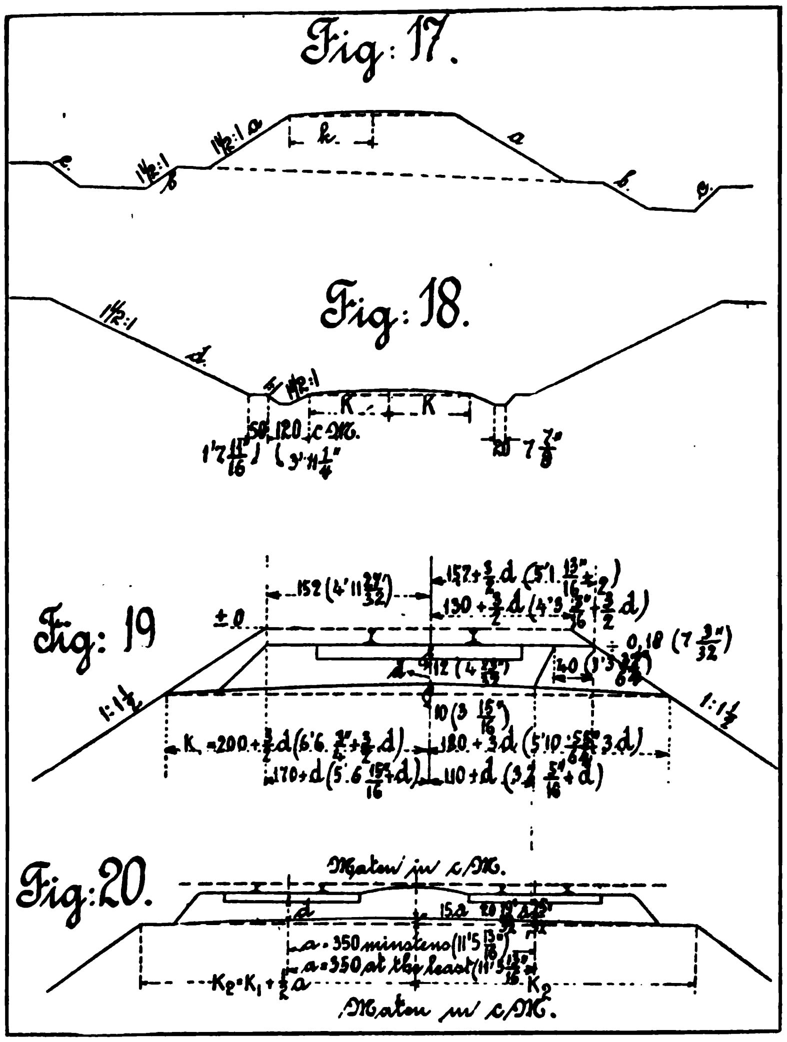
20. *Turntables.*—The largest turntable in use by the S.R. has a diameter of 20 metre. These turntables do not differ much from the well-known constructions. About the turntable of 20 m. it is worth mentioning that it is suspended by means of a pair of heavy wedges, which makes it possible to regulate correctly the height of the table. The turntables nowadays are too heavily loaded, sometimes with 50 to 100 per cent. more than they are calculated for originally. As a fact the turntables of 20 m. diameter also have become too small for the 1—D—D—O locomotives (although these are well turned thereon) a new turntable of a diameter of 27 to 30 m. is in course of construction. Probably this will be moved electrically. In Fig. 3 is given a scheme of the heaviest type of locomotive, for which the turntable is calculated. The S.R. considers the possibility that a similar type in future will run on their lines.

The Formation and the Ballast-bed

21. *The Formation.*—The profiles of the formation are given in Figs. 17 and 18.

It is observed with Fig. 17, that the slopes of the taluds depend upon the kind of ground. The slope of b=that of a; the slope c may be steeper. The measure k is fixed according to Figs. 19 or 20.

22. *The Ballast-bed* (see Figs. 19 and 20).—The thickness *d* of the ballast-bed amounts to 0.35 m. at the sections A. B and C, when there is a good sub-soil, with particularly good sub-soil

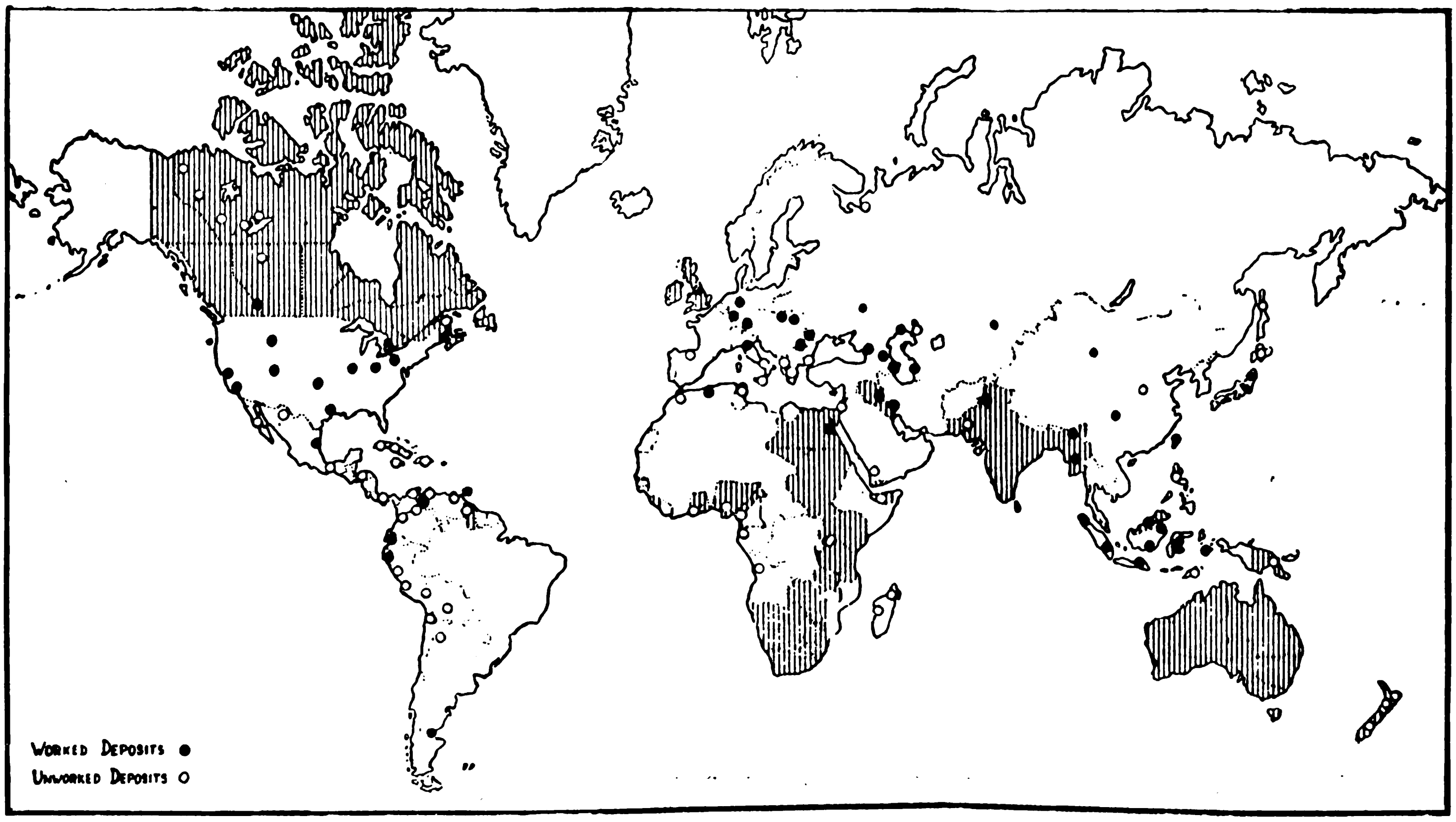


0.25 m. For sections D respectively 0.25 and 0.20 m., sometimes even less until 0.10 m.

For ballast broken stone, gravel and sand is used. Broken stone and gravel, when of a hard quality, give the best ballast-bed

A Valveless Gearless Engine

Any user of internal combustion engines will need no strong argument for the advantage of doing away, if possible, with valves and gears, both of which are a fruitful source of operating difficulties. The idea of an engine without valves or gear has been realized in Great Britain by the construction of an engine which, in the works at least, has given remarkably promising results. This engine has three cylinders; and except for the parts it has no valves. There is not a single gear wheel and all the usual cams, shafts, tappets and springs and even the timing gear are cut out. The only moving parts are the crank shafts, pistons and connecting rods. The experimental engine was rated at ten horse-power and on test developed twice as much. The cycle of operations is not easily described without a detailed diagram but it must be said to depend upon ingenious inter-working between the three cylinders. This engine has been specially designed to meet the conditions in overseas countries, where an extremely simple engine not requiring difficult repairs is for obvious reasons in great demand.



World Map showing Principal Petroleum-bearing Localities referred to in the Monograph
(British Empire shaded)

Petroleum in Eastern Asia

China

IN China are two well-recognized oil-yielding provinces, Shensi and Szechuan, the most important district being in East Central Szechuan, west of Tze-liu-ching, about 100 miles west of Chungking and south of Chintu. About 18 miles south of Tze-liu-ching there is also a heavy seepage, and gas is constantly emitted from crevices in the rocks. There are about 50 wells in operation in this province, the majority of which are in the Tze-liu-ching district. The production of the province amounts to about 30,000 barrels a year.

The production of oil in China has hitherto been entirely incidental to the salt industry, in which it is used as fuel. The wells have been stated to yield from 15 to 50 per cent. of oil, and from 50 to 85 per cent. of brine, the average proportion being about 33 per cent. oil and 66 per cent. brine. The crude oil so far produced burns with a clear flame and is a good illuminant.

The geological formations in China as they have been reported, follow :

Tertiary sandstone, yellow.
Limestone, grey.
Sandstone, red.
Oolite, orange-colored, with petroleum at 600 feet.
Limestone, yellowish, with gas at 300 feet.
Marl, bluish grey, iridescent, white Permian chalk with brine 12 to 15 per cent. at 1,000-1,800 feet.
Schists, greenish, strong brine and flow of gas at 2,500-3,300 feet.

Imports of oil mainly consist of kerosene from the United States and the Dutch East Indies.

There is tank storage at both Hongkong and Shanghai, principally for fuel oil for bunkering purposes.

Dutch East Indies

The islands of Borneo, Sumatra and Java, rank amongst the most important known sources of petroleum, and indications of oil in commercial quantities have also been found in the Celebes and Ceram islands.

The principal producing areas are : (a) in Dutch Borneo, the Koetei and Tarakan areas on the east coast, covering about 500 sq. miles ; (b) in Sumatra, Langkat in the east, Perlak in Atchin residency, and Palembang in the south ; and (c) in Java, Semarang, Rembang and Soerabaya provinces in the north-east.

The oil-bearing strata are of Tertiary age, and generally associated with coal and lignite.

Borneo crude oil from Koetei has been found to contain an exceptionally high proportion of aromatic hydrocarbons, and is therefore valuable as a source of high explosive material, particularly toluol. Tarakan petroleum is a natural fuel oil, while Sumatra produces an oil very rich in petrol.

In the Koetei district of Dutch Borneo, the oil occurs mainly in Miocene sandstones, along anticlines with steeply-dipping sides, and is associated with heavy gas-pressure. The shallow sands in the Koetei fields yield heavy oil of 0·970 specific gravity, with paraffin. The lighter oils from deeper sources are poor in paraffin, and possess a specific gravity varying between 0·860 and 0·890.

The specific gravity of the Langkat oil of North Sumatra is given as from 0·771 to 0·857. In South Sumatra, the specific gravity of the oil from Meliamoen is from 0·765 to 0·775, of that from Kampong Minjak, 0·792, and of that of the oil from Babat, 0·812 to 0·889.

In Java, the chief petroliferous horizon occurs at the junction of the Upper and Middle Miocene ; the wells are quite shallow, varying in depth from 500 to 800 feet, and require pumping. The oil has a specific gravity of from 0·825 to 0·916, and is of asphaltic base, yet yields paraffin wax of high melting-point.

Production (in metric tons) for the period 1905-1920 has been as follows:

—	Dutch Borneo.	Java.	Sumatra.	Ceram.	Total.
1905	439,487	110,711	513,630	—	1,063,828
1906	387,455	111,378	602,501	—	1,101,334
1907	489,151	142,983	713,841	—	1,345,975
1908	511,049	137,013	738,588	—	1,386,650
1909	411,506	140,351	922,894	—	1,474,751
1910	633,472	142,503	719,740	—	1,495,715
1911	814,707	172,438	683,523	—	1,670,668
1912	671,662	184,989	621,481	—	1,478,132
1913	797,059	207,135	529,947	82	1,534,223
1914	866,718	226,590	475,423	487	1,569,218
1915	893,896	256,838	491,611	1,100	1,643,445
1916	957,395	243,442	526,080	3,263	1,730,180
1917	869,123	232,636	583,384	2,248	1,687,391
1918	999,174	225,879	478,068	3,554	1,706,675
1919	1,372.006	235,814	477,977	7,120	2,092,917
1920	1,455,128	311,677	496,351	20,980	2,284,136

Japan and Formosa

Japan.—The belt of oil-producing territory extends along the west side of North Japan, from the west coast of Sakhalin Island on the north, along the coast of the Sea of Japan, through the west side of the central mountain range of Hokkaido, thence stretching across the provinces of Mutsu, Ugo, Uzen, Echigo and Shinano, to the Pacific coast of Totomi in the south. The principal producing districts are Akita in the province of Ugo and Niigata in the province of Echigo. The producing sandstones are of Tertiary age, interstratified with beds of slate or shale, and most of the production is obtained from shallow wells less than 700 feet in depth.

Drilling first took place in Echigo in 1890, when the Nippon Oil Co. successfully brought in a well in the Amaze field, and the development of other districts rapidly followed. The first gusher was brought in at Kurokawa, in the Akita district, in 1914, with an initial production of 10,000 barrels a day. Several others have since been obtained, and in 1916 a new field was proved along an anticline in the Urayama district, parallel with a similar fold in the Kurokawa field. The output has, however, gradually declined, that of 1918 being 101,728 tons less than that of 1915.

The total production for the years 1901-1920 has been as follows:

Year.	Tons.	Year.	Tons.	Year.	Tons.
1901 ..	159,527	1908 ..	294,549	1915 ..	442,793
1902 ..	172,023	1909 ..	268,913	1916 ..	425,415
1903 ..	172,853	1910 ..	246,748	1917 ..	411,768
1904 ..	202,782	1911 ..	248,231	1918 ..	342,814
1905 ..	210,400	1912 ..	236,659	1919 ..	285,000
1906 ..	243,682	1913 ..	274,844	1920 ..	280,000
1907 ..	284,886	1914 ..	388,810		

Formosa.—Indications of petroleum, which have been discovered in Formosa in about 300 localities, occur in 26 oil belts extending for at least 400 miles along the west coast. The Byoritsn and Tabanti fields in the north have already been proved, and the Nairo and Kosempo fields in Ako district, the Senschuiryo field in Tainancho, and the Rokiyukei field in Kagicho are all being exploited.

Distillation of an average sample of the oil gave the following results:—

Specific gravity of crude oil	.. ..	0.8284
Motor spirit (under 150° C.)	.. ..	10%
Kerosene (150°-300° C.)	.. ..	80%
Heavy oil (paraffin and residue)	..	10%

The production since 1906 has been been as follows:

Year.	Tons.	Year.	Tons.
1906	713	1913	2,586
1907	1,090	1914	2,387
1908	1,186	1915	2,702
1909	919	1916	2,753
1910	520	1917	2,791
1911	234	1918	1,926
1912	493		

Philippine Islands

Petroleum occurs as a very light paraffin-base oil, at various points in the Philippine Islands, notably in the Bondoc Peninsula, at Toledo and Algeria in the island of Cebu, and at Tayabas and Luzon. Indications are also reported to occur on the islands of Palawan, Leyte and Mindanao, whilst the islands of Panay, Guimaras, Negros and Bohol appear worthy of further investigations.

Bondoc Peninsula.—American interests recently sent out a geological expedition, and, as a result of favorable reports of petroleum indications, are actively sinking test wells.

Cebu Island.—In 1914 a company was reported as formed for exploiting the petroliferous areas of Toledo.

Sakhalin (Russian)

For a distance of nearly 200 miles and in a belt 6 to 12 miles wide along the Pacific coast of the northern half of Sakhalin, oil indications have been reported in the Tertiary sandstones. Asphalt is found in all stages of density, from the consistency of tar up to a hard, smooth-surfaced mass resembling an asphalt floor. The lake near Oha Creek, over 1,000 feet long, 400 feet wide, and from 2 to 6 feet deep, is estimated to contain more than 25,000 tons of a tough asphalt-like substance comparatively free from foreign matter. Little development work has so far been done.

Syria

Large deposits of asphalt are reported to exist in the neighborhood of Latakia, near the villages of Kferie, Cassab, Ghoman, Chmeisse, Khorbe and Sonlas; also at Hasbeya, on the Upper Jordan, Sahmur and Ain-et-Tineh, on the Nahr Latini, and another Ain-et-Tineh near Magluda.

In Northern Syria a petroleum spring has been reported to the south-east of Alexandretta.

Timor (Portuguese)

Indications of oil have been found in the eastern half of the island of Timor, belonging to Portugal, where limestone is found coated with asphalt and ozokerite, yielding 24 per cent. of crude oil, and pools of black viscous oil are found on the surface.

There are many natural difficulties to be overcome, but it is thought that oil may exist in quantity at a depth of from 1,200 to 1,500 feet in a Triassic formation, and investigations are to be made with a view to a practical test later, if the conditions are favorable. Unfortunately, the geological formations are much disturbed by earthquake action. Many prospectors of various nationalities have visited Timor, but have abandoned their concessions.

One sample of oil from Timor, of specific gravity 0·840, gave a flash-point (Abel close test) of 112°. Another sample yielded 64.6 per cent. of kerosene and about 30 per cent. of intermediate lubricating oils.

Indicating and Recording Locomotive Speeds

Much of the improvement of the locomotive which has been achieved recently is due to the very accurate measurement of performance. Some years ago a British firm brought out an indicator which shows and records the speed of a locomotive by drawing curves on a time basis. A demand arose for an instrument giving records on a distance basis; and the same company has now produced an instrument for that purpose. One great advantage of records on a distance basis is that the exact speed on every gradient and curve or bridge can be at once ascertained. Thus an efficient check is kept on the driver, who is under obligation to reduce speed on certain parts of the line. Although the instrument is much too complicated for a short description it is so robust and so well designed that only three parts require lubricating more frequently than is needed for ordinary enclosed clock mechanism.

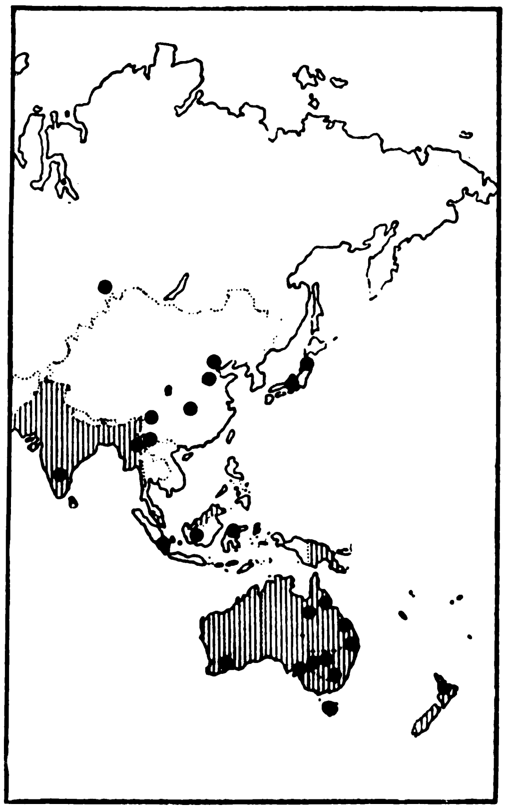
Silver in Eastern Asia

China

IN Chili and North Shansi (North China) silver is obtained from deposits of argentiferous galena. At Tenyung-shang, in the Jehol district of Mongolia, a vein occurs in limestone near the contact with metamorphic schists. It is worked by the Chinese. The vein strikes E.-W. and dips N. 50°-70°. The galena carries 300 to 500 oz. of silver per ton, and blende, also present, 12 to 18 oz. per ton. In the Qusantzu mines, seven miles east of the last, galena with tetrahedrite carries 100 oz. of silver per ton, and occurs in a vein with the same strike and dip and in a similar formation.

In Szechuan (one of the south-western provinces) the Maha gold mine is said to carry a considerable amount of silver. At Lokutetye are veins bearing free gold and lead ores high in silver (300 oz. per ton). At Matasa is a vein of silver-lead, which is said to produce 122 oz. per ton, and another vein bears argentite. At Tachienlu are the government silver mines producing 75 to 90 oz. of silver per ton. The vein is 4-ft. wide and is worked along its strike for over 10 miles. This vein contains complex ore carrying copper, silver and lead, but it is only worked for its silver content. Near Yershe are veins of gold, silver and copper ore, and in the south-eastern district are veins carrying silver-lead.

At Fukea are numerous veins containing copper and silver ore. These mines supplied the greater part of the silver used in the Tang dynasty. Near Huilechao are numerous veins of gold, copper and silver ores, which are worked extensively by the aborigines. In the Yenyuan district are veins carrying gold, silver, lead, copper, zinc and also mercury.



Map showing the Silver-producing Districts referred to in Text
(British Empire shaded)

In the Hunan province, Central China, is the Shuikoshan zinc and lead mine. The country is limestone (probably carboniferous) overlaid by red sandstones and shales of cretaceous or tertiary age. Large irregular-shaped bodies of ore, composed of blende and galena with pyrite and chalcopyrite, are developed in the limestone at and near its contact with syenite. The latter has small crystals of chalcopyrite disseminated through it. The deposit was the direct result of the metasomatic action of the mineral-bearing solutions emanating from the magma. Lead concentrate contains from 9 to 38 oz., and zinc concentrate from 2.5 to 15 oz. of silver per ton. The only other deposit with an important output is that of Kungshan in Tungchwan (Yunnan province), where the principal ores are carbonates. The production from the Weihungchow district, Kweichow, is chiefly silver.

The amount of silver produced in China in 1914 was insignificant, and probably did not exceed 50,000 oz.

For 1917 the production is given as 63,900 oz., and that of 1918 as 70,000 oz. (U.S. Bureau of the Mint).

Dutch East Indies

Borneo.—A vein near Budok, Dutch Borneo, contains sylvanite (a telluride of gold and silver).

In the Kahajang mine, of the central auriferous district of Dutch Borneo, there is some silver in the ore.

Celebes.—The sulphide gold ores at Palehleh, on the north coast, contain 12 oz. of silver per ton.

Sumatra.—In the Redjang-Lebong lodes the ratio of silver to gold in the bullion is often as high as 10 to 1. In 1906 and 1907, the mine produced 248,240 and 327,584 oz. of silver respectively.

In Western Sumatra, from Tjalang to a point on the coast opposite the island of Poolo Raja, garnet and wollastonite lenses occur in ancient schist, which carry copper (as bornite), gold, silver and some platinum--silver being by far the chief product.

Japan

Silver-mining in Japan dates from a very early period, the oldest records referring to the discovery of silver ore in the island of Tsushima, in the year A.D. 674. From then until the year 1896 many deposits were opened up, but during the course of the next few years a number of these had to be abandoned on account of the fall in the price of silver.

The production of the metal gradually increased from 1874 to 1895, but from 1895 to 1904 remained nearly stationary, in spite of the rapid progress made by the gold and copper industries. In 1905 there was a considerable increase in the production owing to the conspicuous development of the Kosaka mine and the general increase of the silver production in the gold and copper mines. The great increase in 1908 was due to the development of the Tsubaki mine, and the total output for that year was more than 17 times the output in 1875, and 2½ times that in 1900. Generally speaking, the production of silver extracted from silver ores proper is declining, but the total output is maintained or increased by the increasing amounts of the metal obtained as a by-product in the treatment of gold and copper ores.

Production of Silver in Japan, 1880 *to* 1919

Year.	Troy Oz.	Year.	Troy Oz.
1880	332,406	1915	5,120,293
1890	1,699,029	1916	5,805,700
1900	1,890,716	1917	7,111,700
1910	4,581,613	1918	6,600,400
1913	4,649,910	1919	5,163,068
1914	4,836,228		

(U.S. Bureau of Mint.)

Production of Silver by the Principal Japanese Mines in 1919

Mine.	Locality.	Troy Oz.	Mine.	Locality.	Troy Oz.
Hitachi ...	Ibaraki	1,355,857	Sado ...	Niigata	171,252
Saganoseki ...	Oita	902,029	Ikuno ...	Hyogo	171,146
Ashio... ...	Tochigi	581,304	Yoshioka ...	Okayama	132,637
Kosaka ...	Akita	559,991	Abeshiro ...	Aomori	132,616
Kamioka ...	Gifu	222,796	Other mines...	—	752,660
Mitsui-kushikino	Kagoshima	180,780	Total ...	...	5,163,068

The production of the twenty most important mines during the five years prior to 1908 aggregated 85.2 per cent. of the total output. The greater part of the silver produced by these mines came from argentiferous lead ore; 18.6 per cent. from normal or dry silver ore, and 15.7 per cent. from argentiferous copper ore. It is to be noted, however, that there is a tendency for the output of silver from copper ores to surpass that derived from dry silver ore.

The silver deposits, whether in the form of veins, impregnations, or metasomatic replacements, are practically confined to tertiary volcanic flows of liparite and andesite and tuffs of the same age. On the other hand, the economically unimportant contact-metamorphic deposits are restricted to the region occupied by pre-tertiary rocks.

Several of the principal mines exploit dry silver ore as well as argentiferous lead and copper ores, which occur as lodes traversing eruptive and sedimentary rocks of tertiary age. Of considerably less importance are argentiferous lead and copper ores which occur as impregnations in tertiary rocks. With regard to deposits of the metasomatic type it is stated that, although great numbers of such deposits exist, the only one actually explored is the so-called Kuroko deposit. The Kuroko deposit was worked in conjunction with the Tsubaki mine, which in 1908 yielded the greatest output of silver of any mine in Japan.

Numbers of deposits of the contact-metamorphic type are known, but only a few are important, such as those at Kamioka and Hiragane in Hida. These occurrences are very commonly situated at or near the contact between igneous intrusions and Palæozoic or pre-Cambrian strata.

The Tsubaki mine, opened in 1889, no longer produces. The country rock consists of tertiary shales and andesites. The ore is the so-called "kuromono" or "black ore," a mixture of argentite, blende, galena, pyrites, chalcopyrite, barytes, quartz and calcite. It contains generally 0.07 per cent. of silver, but the richer parts yield 0.15 per cent. to 0.3 per cent of the metal. The Kosaka mine was opened in 1866, and is one of the most important in Japan. The ore is of the kuromono type and yields copper, silver and gold, and occurs as a large mass in tertiary tuff near its contact with dacite. The Ikuno mines are said to have been started in 807, although it was not until 1542 that they were worked on anything like a large scale. There are two principal mines, namely, the Tasei and the Kanagase, which yield copper, silver and gold. The country consists of tertiary tuffs, liparite and associated rocks, and the ore is made up of argentite, native gold and silver, with chalcopyrite, pyrite, galena, blende, pyrargyrite, stibnite, quartz, calcite and rhodochrosite. These minerals occur in a series of veins. The Kamioka deposit is said to have been discovered about 1,200 years ago, and yields silver, copper and lead. The rocks are hornblende gneiss with limestone and intrusive quartz-porphyry, and the deposits, which consist of argentiferous galena, chalcopyrite, blende, actinolite, epidote, with calcite, quartz, pyrite, etc., occur as lodes.

Siberia

The silver-lead mines of Western Altai, government of Tomsk, were important in the early part of the nineteenth century. In Central Altai the deposits lie for the most part in carboniferous limestone and occur as lodes carrying silver-bearing lead ores mixed with a large proportion of barytes. Silver tellurides are also mentioned as occurring in these deposits. The mines have been worked out to depths of 700-ft., and operations did not apparently pay in depth. The deposits in the Salair mountains are very similar in their mineral contents, as likewise are those in the Kolybane district, but are stated to be much richer. The Zmeeff mine near Kolyban Lake, south of Barmaoul, exploited a particularly rich shoot of ore. Another rich group of mines is the Rydirsk group.

In 1845 the silver production of the Altai is given as 26,331 oz. and in 1891 as 313,462 oz.

Oil in the Philippines

By H. Edmund Bullis

WITH the tremendous increase in the world consumption of oil, the finding of petroleum in the Philippines is of tremendous importance. The experts from the bureau of science have for many years been investigating the possibilities of petroleum in the Philippines, and have located petroleum-bearing shales and oil seepages in several provinces, notably in the Bondoc peninsula, Tayabas province, Luzon, Leyte and in Mindanao.

The first real attempt to obtain oil in the Philippines was in 1896, when an English company started drilling on the Smith-Bell estate near Toledo, Cebu. This company had obtained the services of an experienced Pennsylvania oil driller and when their well was down about twelve hundred feet, they were surprised by insurrectos and forced to abandon their work.

Because of the enormous expense and the uncertainty of oil drilling operations, no real attempts have been made since that time until last year, when the Richmond Petroleum Company, a subsidiary of the Standard Oil Company of California, actually started operations on the Bondoc peninsula.

This company has been working for about eighteen months, preparing the way for the drilling work on the Bondoc peninsula. At the present time this company has leased approximately 36,000 hectares in this locality and during the past year the government has been pushing the cadastral survey in order to establish beyond doubt the ownership of the land which the Richmond Petroleum Company has leased. Due to the present uncertainty of ownership of a part of the land in this tract, it has been necessary in many instances to make contracts with different claimants to the property until the results of the survey have been made known and claims passed upon before the cadastral court.

Drilling for oil in the Philippines is certainly not a poor man's game, since it costs from two to three times as much to drill here as it does in California. The Richmond Petroleum Company has brought over approximately $200,000 worth of equipment and has twenty-four Americans actively engaged in the drilling operations. One thousand tons of machinery and supplies were landed upon the beach near the drilling site from the United States shipping board vessel *West Cahoot* in three and a half days, by lighters of the Atlantic, Gulf and Pacific Company. By means of a Holt tractor with two trailers, this material was transported to the camp, which is now adequately equipped with electric lights, an ice plant and a wireless station.

This company's first attempt at drilling was on a lease in the vicinity of the Amuguis river, three to three and half miles north of the southern extremity of Bondoc peninsula. The first drilling site is located on the south end of a low, broad dome or doubly plunging anticline. There are no natural indications of oil such as seepages or asphalt within this anticlinal area, but at Bacau, two miles north of the northern end, there is an excellent showing of very light oil near the Canguinsa river. The shale, when placed

in water, yields a very thin sheet of oil which spreads very rapidly. There are several test wells at Banco, four miles northeast of the drilling site. A poor showing of oil shale occurs at Sili, about four miles northwest of the drilling site.

The drilling of the first well was with a rotary outfit for deep well drilling, and a seventeen inch hole was carried to a depth of 1,065 feet. At three hundred and fifty feet, in a fine grained sandstone, a fair showing of oil and gas was encountered. The thin, light oil spread over the mud, which came from the bottom of the hole as a return fluid from the rotating fish tail of rotary. A better showing was reported at five hundred and fifty feet, and this stratum has continued to yield combustible gas bubbling through the thick mud. While these indications are encouraging, they do not demonstrate an economic source.

At the depth mentioned above (1,065 feet), the hole caved in and it was necessary to put in 12½ inch casings. The operation was then continued to a depth of 1,323 feet, when caving troubles became so serious that drilling of the first well had to be stopped about the middle of May.

A new site has been selected about two miles from the first drilling site and a new attempt is being made. While this failure of the first well to produce is discouraging, it is only one of the trials connected with oil well drilling. The new well will be cased as it is drilled, which process, of course, will take much longer than the rotary drill process, but will prevent the caving in which occurred in the first well.

The Vigo group, the strata in which oil seeps frequently occur, is widespread throughout the Philippine Islands, and in many places, such as Mindanao, Cebu and Leyte, its shales are petroleum bearing. One and a half miles east of the barrio of Baliti, on the northwest coast of the island of Leyte, there is an indication that in *times past* there existed an economic source of petroleum. This exposure is in a fault block, and asphalt prospectors have developed in its north end a very excellent surface for study. This stratum is from fifty to seventy-five feet in thickness, and from visible outcrops appears to be about six hundred feet in width and six hundred feet in length. How much greater in extent it may be is unknown.

The rock composing this outcrop is a mixture of porous ash and pumice, which was laid down in the quiet waters of the Vigo sea. Numerous small animals have also contributed their limestone skeletal material to this rock. Later, this portion of the sea bottom was lifted, folded and its pores were thoroughly impregnated with petroleum. still later, faulting took place and the petroleum reservoir was cracked, while lighter portions of the petroleum evaporated, leaving in the twenty-five per cent. voids of the rock a thick, tarry, bituminous residue.

If the Richmond Petroleum Company succeeds in drilling into loose sandstone or tuff similar to this Leyte occurrence, it is quite possible that an economic deposit will be developed in the south end of the Bondoc peninsula.

If oil is found in commercial quantities, it cannot be determined at the present time whether or not refineries would be built on the field, or elsewhere in the islands, or whether the crude oil would be sent to other parts of the world for refining. At the present time, the only refineries in the Orient are the Dutch Shell Refineries in Borneo and Sumatra. If gas should be found in sufficient quantities with the oil, it might pay to build a refinery right in the field and the various by-products could be shipped from the refinery to the places of distribution. On the other hand, if little gas is found, and if the quantity of oil obtainable warrants, pipe lines could, undoubtedly be built to the ocean, where oil tanks could be erected as storage stations while waiting for the crude oil to be loaded on ships.

The importation of petroleum products into the Philippines is becoming a more important factor every year. The table published below gives some idea of the rapid growth of the use of petroleum products in the islands.

This table does not include the large amount of petroleum products used in the navy. It can be seen from these figures that if we could produce enough petroleum products in the Philippine Islands to satisfy our needs only, it would be an economic saving of nearly twenty millions of pesos per year. If extensive oil fields were found, we might have enough petroleum products to export to other places in the Orient.

The Richmond Petroleum Company is taking a great risk in this hazardous venture to prospect a practically virgin field for petroleum, and it is the hope of the American chamber of commerce that it will succeed in its undertaking.

Importation of Petroleum Products into the Philippine Islands (Bureau of Customs)

	1920	1919	1918	1917
	P.	P.	P.	P.
Crude Oil	2,010,224	352,439	138,407	55,759
Naphthas, including all lighter products of distillation ..	7,666,168	4,795,364	1,106,229	1,672,755
Illuminating Oils ..	7,715,706	6,677,590	2,426,920	2,673,335
Lubricating Oils ..	1,248,260	1,251,405	796,718	538,615
Totals	18,640,358	13,076,798	4,468,274	4,940,464

Progress in the Field

To date there are sixteen petroleum companies which have made application for, or have been granted, leases in the Philippines. Of these only one is operating and two are exploring. The only operating company, the Richmond Petroleum Company of California, according to its third and latest quarterly report, had reached a depth of somewhat more than 300 metres in its first well on lease tract Amuguis No. 1, Bondoc peninsula, Tayabas province, Luzon, when caving in the hole became so bad that it had to be abandoned. A "show" of oil and gas was obtained at about 100 metres depth, but not in economic quantity. It was then decided to move the rig about 3 kilometres farther north to a point higher on the structure where it is expected that drilling will be resumed in October.

This company has a very complete equipment of up-to-date well drilling machinery, both standard and rotary machines, twenty-four American drillers and mechanics, and a large force of natives. The entire plant is very complete. In addition to erecting several buildings, the Company has had to build roads in virgin country. It has an ice plant, a necessity in this country, and also enjoys radio connections with Manila. Besides the operating force on Bondoc peninsula, this company maintains a central office in Manila and three field parties are engaged in geological investigations in various parts of the archipelago.

The public can get some idea of the methods of a large oil company, when it learns that a geologist of this company was on the ground for a year and a half before drilling was commenced, and this after the government had already done a great deal of preliminary exploratory work, which work was available to the company.

Copra in New Guinea

A little known source of copra is being developed in the former German possessions in New Guinea. The German owners of the plantations were allowed to continue operating them during the war, but as they were not permitted to send their profits out of the country, these were employed in clearing the jungle and in making extensive new plantations, which will be coming into bearing at different times during the next four or five years. It is expected that the existing production of copra will increase from the former 18,000 tons to at least 28,000 tons. It has been decided not to permit the importation of laborers from other countries, but to rely upon the native Papuans and Malaysians, who make fairly good cultivators. The former German laws relating to indentured labor have been abrogated and liberal regulations introduced under which there are now 30,000 laborers on the plantations in place of the 17,000 in 1914.

The Far Eastern Review

A Monthly Review of Far Eastern Trade, Finance and Engineering, Dedicated to the Industrial Development and advancement of Trade in Far Eastern Countries

ENGINEERING FINANCE COMMERCE

5 JINKEE ROAD, SHANGHAI, CHINA

Telegraphic Address: Farview, Shanghai

SHANGHAI, APRIL, 1922.

"The Policy of 'The Far Eastern Review'"

By Its Publisher

THE Treaty is ratified. The attitude of THE FAR EASTERN REVIEW has been justified by events. It is now possible to be more explicit in explaining an editorial *volte-face* which caused considerable comment in Far Eastern and American journalistic circles.

With the ratification of the treaty, comes a book entitled "An American Diplomat in China," which strengthens the position of THE FAR EASTERN REVIEW by a public confession of the exact nature and object of a campaign, which, in its inception in 1915, compelled me to retire from active journalistic work in China because I could not conscientiously support American policy as then interpreted by the last American minister to China. When, at the peace conference in Paris, followed by the campaign for war with Japan, it became clear that the nation was being railroaded into a dangerous position by Minister Reinsch and his co-workers, I determined that the time had arrived for the initiation of a counter-campaign that would bring about a solution of Far Eastern problems along more rational lines.

To do this I have had to present Japan's side of the case. I hold no illusions about Japan or her militarists, I hold no illusions about China, or her militarists. Notwithstanding my great sympathy for the latter country, it would never bear stretching to the point where I could advocate hostilities between America and Japan or demand a "show down" that the American people would not support. My sympathy has been with the Chinese people, and I have never swered from my original ideas except where it became essential to present Japan's side of the controversy so that Americans would have all the facts before them. My fight has been conducted against the activities of those Americans, who, like Minister Reinsch, induced the Chinese officials to believe that the United States would fight Japan single-handed in order to redress their real or fancied wrongs. I was told on my arrival in China nearly two years ago, that "I could not size up a situation." I couldn't, when it came to supporting the agitation against Japan, then at its height. I could, however, size up the situation in America. I knew something the agitators and sentimentalists overlooked. I knew the American people. I knew that the real red-blooded American would never go to war with Japan over China. I knew that Americans would never go to war with Japan without some initial aggressive move on her part. I knew that when it came to a "show down" the manhood of America would never accept quietly being hustled on transports to cross the Pacific to fight Japan, unless they were well satisfied that the safety of their own country was endangered. If, as I was assured time and again, by leaders of the rabid anti-Japanese movement," the United States must fight Japan; that war was inevitable; that now was the time, before she become stronger; then, there was every humanitarian and patriotic reason why all sides of the case should be aired. Never again will the people of the world be plunged into the horrors of war without a full knowledge of all sides of the facts, I knew, personally, of secret moves that had been made during the war by overzealous and mentally-warped Americans, in their endeavor to curry favor with China by attacking Japan. I also was well informed that in many small and petty ways the Japanese had well earned the ill-will of Americans, British and Chinese, and that an international association in North China was preparing an indictment of their activities during the war, but these deeds, to my mind, could never be stretched into a good reason why America, single-handed, should challenge Japan. I sensed that those most active in yelling for war with Japan would be most conspicuous by their absence from the fighting forces if hostilities were declared.

There was every good patriotic reason to fight such a propaganda, and when the attempt was made in March, 1920, to penalize this publication for its attitude, and every underhand, disreputable and questionable method employed to "put THE FAR EASTERN REVIEW out of business," I accepted the challenge. We have won. I can now express myself more freely and invite attention to the book by Dr. Paul S. Reinsch, entitled "An American Diplomat in China," published by Doubleday Page & Co., the first copies of which have just arrived in the Orient.

The title is a misnomer. A perusal of the book will reveal that far from being a diplomat in the strict sense of the word, Dr. Reinsch was the Poo Bah of Peking, the Shogun of China, the power behind the presidental chair, with a finger in every pie, consulted at all times by all manner and classes of Chinese from the president down the line through the cabinet, tuchuns, politicians and even unto the school children. However, that is a separate story. We simply desire at this point to invite attention to the closing chapter of the book and to Dr. Reinsch's letter to President Wilson tendering his resignation as American minister to China.

On page 382, Dr. Reinsch informs us that his resignation was tendered in the hope of enabling him to develop closer relations more effectively between China and the United States. "*I wished to bring about positive practical, action.* The spirit of the American policies and declarations was admirable, but not enough individual and specific American activity in China accompanied them." Now what was this positive practical action so much desired? In his letter of resignation dated June 7, 1919, after a violent indictment of Japan, he says "Since the complete breakdown of Germany the case of Japan has been carried through solely on bluff though perhaps it may be that the Japanese militarists have succeeded in convincing themselves that their establishment is formidable. *But it is plain that they would be absolutely powerless in the face of a stoppage of commerce and a navy demonstration on the part of any one of the great powers. No one desires to think of this contingency, but it is plain that after the breakdown of Germany it was not feasible for Japan to use force nor could she have suffered a greater damage than to exclude herself from the peace conference where she had everything to gain and nothing to lose. In ten years there may be a very different situation. Then also our people, having grown wise, will be sure to shout; 'Why was not this stopped while there was yet time?'*"

The story is outlined in the above undiplomatic words. Dr. Reinsch was advising the president to call Japan's bluff through a naval demonstration and a stoppage of commerce, which, for all practical purposes, amounts to a declaration of hostilities, and he sounds the keynote that has been repeated to me by all his co-workers. "*Now is the time;* now, before Japan grows stronger"; and if the president in his wisdom should fail to heed the warning, Dr. Reinsch tells him that in ten years, the nation will demand to know why it was not done sooner!

Dr. Reinsch was a quick worker. He was not so sure about the naval demonstration and hurried home to help along the cause of Armageddon. Although there is no direct proof that Dr. Reinsch advised the Chinese to boycott Japanese goods he did not advise against it, and there is proof that as soon as he placed foot in the United States, he urged in a press interview that Americans should hurry to China to skim off the cream of the Chinese trade while the boycott was on.

With the confessions of Dr. Reinsch before us it is not difficult to understand who was the master mind of the agitation to precip-

itate hostilities between Japan and America and it is easy to understand why, with this high example before them, the secretaries of American chambers of commerce in China, the Millard coterie, and others all worked in close unison with their chief. Never before in the history of such (movements) did such close team work prevail. From the time that Mr. Thomas F. Millard hurriedly departed from Paris in May, 1919, "to break the treaty in the senate," the anti-Japanese war-party lost no effort to precipitate hostilities, disguised under the thinly veiled hope that Japan was bluffing, that she would not fight. They refused to listen to any other method of settling these Oriental problems. America had the money and the guns ; they wanted the latter pointed at Japan while we told her what to do in China and Siberia. In every way they brought pressure to bear on congress to intensify a situation they had been instrumental in creating. When Millard was solemnly warning the senate committee on foreign relations that the Shantung award at Paris meant war, quoting Mr. E. T. Williams, the chief Far Eastern adviser to the American delegation at Paris, Mr. J. B. Powell, his colleague, editor of *Millard's Review*, acting in his capacity as secretary of the American chamber of commerce in Shanghai was flooding the United States with circular letters calling upon firms interested in China to write to their congressmen and senators to demand from the state department the secret correspondence and memorandum that would disclose Japan's discrimination against American trade in Shantung and elsewhere, and have these documents read into the congressional records. An open incitement to hostilities. At the same time, the secretary of the American chamber of commerce at Tientsin was also sending out similar circular letters in which it was stated that only through armed intervention could China's sovereignty be preserved. Another open invitation for armed assistance to China. Nearly all of these so-called secret reports had been written during the war and there must have been a very close and intimate co-operation for their contents to be so widely known. It was a difficult situation, one that might well have led to most serious consequences, had not other far-sighted, conservative Americans got together to oppose the movement. There was every reason to believe that the war group with the reins of the situation in their hands would stop at nothing to hold their advantage.

We have no desire at present to reveal the depths of the underhand campaign employed by our political opponents to damage the prestige of this publication by the circulation of false reports, sufficient to say, however, that most of the proofs of the conspiracy is in our hands, the evidence all pointing conclusively to a tacit understanding that THE FAR EASTERN REVIEW was to be "put out of business." Chief amongst these reports was one that "The FAR EASTERN REVIEW had sold out to Japan," that it had received large sums to conduct Japanese propaganda, etc. These reports, from proof in our possession, emanated from the same sources that had previously circulated the story that THE FAR EASTERN REVIEW had been sold to the British, part of a deliberate attempt to destroy its usefulness amongst American manufacturers for the benefit of a competing magazine published in Shanghai, and edited by an American who acted as secretary to the American chamber of commerce. This, however, is a separate story, which will be brought before the American chamber of commerce at the proper time and place.

The policy of THE FAR EASTERN REVIEW has been aggressively American, reflecting the views of the most important interests in the United States as opposed to those Americans in China who insist that their opinions must be accepted as the basis of American policy in this part of the world. The views of the big business men in America were shared by their colleagues in Japan who stood opposed to the military policies of their own government and desired an honorable solution to existing problems so both nations could co-operate harmoniously for the reconstruction of China.

Both sides felt that the agitation for a "show down" could only end in hostilities, in which the greatest sufferer would be China. They held that only through frank conversation and exchange of views could a mutual understanding be arrived at. There were certain limitations that had to kept in mind. Japan would tolerate no interference with her rights in Manchuria gained as the result of two wars. She was willing to sacrifice all other advantages in China, but here she stood firm. There were angles to this situation that had to be explained so that Japan's case could be made clear. We have tried to place these facts before our readers, so that, in the event of a "show down," Americans would understand the other side of the case. The Washington conference was convened for the sole purpose of solving these problems, and it is gratifying to this publication to see that its policy all along the line had been fully vindicated.

We were the first paper in the Far East to point the necessity of a four-power pact to supersede the Anglo-Japanese alliance, and the first to call for a Pacific conference so that China's *full* case could be presented. The campaign of THE FAR EASTERN REVIEW for a better understanding through mutual concessions has been terminated. Our policy from now on is to contribute as far as possible to the reconstruction of China through international co-operation. We do not advocate that American firms in China should hand their business over to Japanese, but we do believe that China will be benefitted by a more friendly co-operation between American and Japanese capitalists, the first step in which is the success of the consortium, or, in the event of its dissolution, some other understanding that will permit the two nations to co-operate in China without friction.

Foreign Armed Forces in China

THE powers recently concluded a conference at Washington, in which, amongst other things, steps were initiated for the purpose of restoring, as soon as practicable, China's sovereignty, and to this end, all foreign troops are to be recalled. Yet as soon as it becomes evident that this decree is to be carried out the American chamber of commerce at Tientsin vigorously opposes the withdrawal of American troops from North China. "In view of the uncertainty of the political and military situation in China and the activities of large numbers of bandits," the chamber declares that the "withdrawal of the American troops at Tientsin would endanger the lives and property of Americans in China."

Now, if the property and lives of Americans in North China are endangered, the properties and lives of Americans in Shanghai, Hankow and other southern and Yangtze river ports are equally in danger. If there is a likelihood that the forces of Chang Tso-lin and Wu Pei-fu may come to grips in North China, the same possibility menaces Hankow as the forces of Sun Yat-sen move northwards and those of Wu Pei-fu attempt to check them. If Sun Yat-sen should make a diversion and send his troops down the river valley to Nanchang, with Nanking and the control of the Shanghai-Nanking and the Tientsin-Pukow railways as his objective, the lives and properties of Americans in Shanghai, Nanking and other ports will be endangered. There is just as much of an eventuality that internal disorders will break out in Central China as in the north, and American interests in the Yangtze should be equally as well protected. So, if the presence of an American regiment is essential to the peace of mind and security of Americans in Tientsin, two more regiments are necessary to insure equal tranquility amongst Americans in the Yangtze valley, to say nothing of Canton and South China.

American and foreign troops are in Tientsin in accordance with the terms of the Boxer Indemnity treaties, *for the sole purpose of keeping open the railway from Peking to the sea.* They are not there, as we understand it, to guarantee the lives and properties of American citizens in North China against the depredations of bandits or the dangers incidental to domestic strife. If the precedent established in 1900 for the sole protection of the legations is now to be extended to cover the uncertainties of internal politics and protect foreigners against the possible consequences of domestic warfare, then the principle must in all equity cover other parts of China where Americans have as much at stake as those residing in Tientsin.

The attitude of Americans in Tientsin is adequate proof of the hollowness and speciousness of past denunciations of Japan for maintaining troops in China for the protection of her nationals. Japan has a force stationed in Hankow, for what specific motive, we have never been able to fathom, but there is ample reason to believe they are there for the protection of Japanese merchants, their families and their properties, in which, it may be taken for granted, that their equity in the great Han Yeh Ping Steel Works is a vital consideration. The Japanese stationed troops in Shantung and in Chientao, they have entered Siberia and North Manchuria for the avowed purpose of insuring adequate protection to their nationals against the operations of bandits and other armed forces; they have gone further, and through the medium of the twenty-one demands extracted from China the privilege of establishing police boxes in various parts of Manchuria for the protection of the lives and properties of Japanese subjects against the depredations of the Hunghutzes.

Every such move has called forth the bitter denunciation of other foreigners. The American chamber of commerce of Tientsin, through its secretary, was responsible for a lengthy circular letter to firms at home which emphasized that, because of the presence of Japanese troops in Shantung, foreign armed assistance alone could restore the province to China. The shoe is now on the other foot. The American government has solemnly pledged itself to the full restoration of China's sovereignty, and to withdraw its troops as one of the first proofs of its sincerity, yet as soon as it appears that such a desirable example is to be set for other nations to follow, American residents in Tientsin are the first to protest.

We do not wish to be misunderstood. We believe there exists ample justification for the fears expressed by the American chamber of commerce of Tientsin. But it is equally true that the same menace confronts Americans in Hankow and the Yangtze valley ports, who have as much right to demand a regiment for their protection as Americans in the north. American troops are in Tientsin for the specific object of keeping open the railway from Peking to the sea. If they are to be retained there indefinitely for the protection of American lives and properties because of the uncertainty of the political and military situation and the activities of large number of bandits, the precedent is created for dispatching further American and other forces to other parts of China. The uncertainty of the political and military situation and bandit activities are chronic symptoms of the Chinese situation. If it is not Chang Tso-lin against Wu Pei-fu or Sun Yat-sen against the field, one tuchun or another in some other part of China is on the rampage. No section of China has been free from these disturbances for the past decade, and from all appearances, they have become normal and will continue so for some time to come. Let us then be honest with ourselves, with the other powers and with China. The plea of the American chamber of commerce of Tientsin, if acted upon by the American government, creates a principle that must be extended for the protection of Americans and other foreigners in other parts of China. The protest against the withdrawal of the American regiment at Tientsin is a frank admission that Japan has been justified, when, in the past, she has stationed troops in China to protect the lives and properties of her subjects. It would appear reasonable to believe that if foreign troops are still required to carry out the Boxer treaty provisions for safeguarding the railway from Peking to the sea, an aeroplane squal at Tientsin, would be just as efficient as an entire regiment. A few "crates of eggs" kept in cold storage to be judiciously dropped where they will do the most good at any time the line is menaced by contending forces, would prove more economical and persuasive in keeping it open, than a regiment of infantry acting as railway police. It would be difficult for the Chinese to repeat the mistakes of 1900. The installation of radio plants and the use of aircraft are an assurance against a repetition of the Manchu folly.

The powers at Washington have expressed their faith and hope in China and it is now up to her leaders to bring order out of chaos and demonstrate that they are worthy of the confidence reposed in them. The retention of an American regiment in China under the conditions set forth by the Tientsin chamber of commerce is not only provocative and a menace of further intervention, but a direct indorsement of policies that Americans have been the first to denounce.

China is entitled to every assistance in the difficult task of reorganization and unification that confronts her. The continued presence of foreign troops in North China is a standing invitation to ultimate intervention in her affairs, an obstacle to a proper solution of the admittedly uncertain political situation and an influence that can be utilized to advance or defeat the interests of opposing political factions. Whether Chang Tso-lin, Wu Pei-fu, Tuen Chi-jui, Sun Yat-sen, or any other factional leader gains the ascendency and controls the Peking-Mukden railway should be a matter of supreme indifference to other nations. It is China's railway, and whether it remains open to traffic or not should be equally indifferent to foreign governments. If the uncertainties of the internal political situation, the danger of civil warfare and the depredations of bandits threatens the uninterrupted operation of the line between Peking and the sea, the most sensible thing for the legations to do is to move to Tientsin or some other safe place. The only justification for the continuance of a large foreign force to insure uninterrupted communication between Peking and the sea would be in a recrudescence of the Boxer spirit and a possible seige of the legations. If we admit that this is impossible, then the continued presence of foreign armed forces in North China is an aggression upon the rights of China. The internal condition of China to-day is not peculiar. Other nations have gone through their periods of readjustment and civil war with its inevitable aftermath of banditry on a large scale. When conditions have become so bad in their capitals that communications with the outside world have been interrupted, the representatives of other nations have either moved their offices to the ports, or accepted the situation and taken their chances in the capitals of the governments to which they have been accredited.

If there is no danger of a repitition of the Boxer outbreak, then the continued presence of the armed forces of the powers in North China is contrary to the spirit which animated the deliberations of the Washington conference. Americans in North China have no more right to expect that a regiment should be stationed at Tientsin, than Americans in Shanghai, Hankow, Canton and other parts of China have to demand similar forces to insure their safe access to the ports in the event of internal troubles. If an American regiment remains in Tientsin, we must be prepared at any time to witness another invasion of China by foreign armies. For, it goes without saying, that other powers, in the event of trouble, will insist on sending as strong a force into North China as may be maintained by Americans, in order that the latter may gain no undue advantage.

If a large American force is maintained in North China to see that China gets a square deal in the event of future trouble and to offset advantages that might be obtained by another power whose forces might be numerically greater, then let us also be frank about it so the American tax payer will understand why he is called upon to pay this extra burden. Whatever force such an argument may have had in the past, has been vitiated by the Washington conference. If the time ever arrives when armed intervention in Chinese affairs becomes necessary, there are sufficient troops six days away in Hongkong, Manila, Indo-China and Japan to handle the situation. The continued presence of the American troops in Tientsin is opposed to the best interests of both China and the United States.

Owing to the disturbed and uncertain political conditions in China, with Canton proclaiming the illegality of the Peking president and cabinet, maintained in power largely through the recognition of foreign governments, the presence of foreign troops in North China gives an undue advantage to Peking as against the claims of Canton. Their presence, therefore, constitutes a direct intervention in the internal affairs of China, and materially strengthens the arguments of Sun Yat-sen and the southern government. Take the foreign troops away from North China, and if the legation staffs and foreigners resident in Peking are reluctant to take their

chances in the event of disturbances in the capital, let them remove to Tientsin or some other safe place, and permit the Chinese to settle their own affairs in their own way. As long as the legations remain safely in Peking protected by their guards with an American regiment keeping open the railway line to the sea, so long will a settlement of China's internal difficulties be delayed. Once these troops are withdrawn, and foreigners resident in Peking provide proof of their fears by removing to Tientsin, the prestige of the Peking government will wane and a way soon found for the long delayed unification between North and South.

It is natural to suppose that the legations and foreigners resident in Peking will be extremely loath to entertain any proposition that might disturb their repose, and that many excellent arguments will be presented in order to keep American troops in North China. But if this is to be done, let the facts be clearly understood. Let us be consistent. If the presence of an American regiment in North China is deemed necessary for the protection of American lives and properties growing out of the uncertainty of the political and military situation and the activities of bandits, American residents in Hankow and Shanghai have the undoubted right to demand similar protection, and because of the same perturbed conditions existing in northern Manchuria, Japanese residents in Harbin have the same right to demand a regiment or so for their protection against the Hunghutzes and the Red armies of Lenin. Keep the American troops in North China if conditions so warrant, but let Americans forever after close their mouths about the presence of Japanese troops in parts of China where the lives and properties of Japanese are exposed to the uncertainties of the military and political situation and bandit activities.

GEO. BRONSON REA.

China's Mineral Resources

IS it not about time that a stop be put to propaganda about China's unlimited mineral resources, and face the truth ? For many years the world has been told of the Klondike-like opportunities existing in the development of China's mineral resources until it has become accepted as a fact. As a result of this campaign, many mining engineers and prospectors have been lured to China in the hope of striking it rich, and have departed very much out of pocket and disgusted with the prospects. A sample of this propaganda is seen in a recent statement by Roger W. Babson, the famous American economist, in which he says :

" China to-day has the greatest natural resources in the world. The greatest virgin deposits of coal, iron and copper are in China. It possesses great undeveloped water powers, wonderful fertile valleys, and great primeval forests. By nature it is the richest country in the world. But unlike South America, which is also rich in natural resources, China has a great and industrious population. The largest available labor supply in the world can be found there to-day."

Such broad unqualified statements can result in no permanent benefit to China, for investigation only proves their fallacy. The great undeveloped water-powers exist perhaps in the Far western provinces, but it will many, many, years before they can be made available to turn the wheels of industry. As to great primeval forests the same statement holds good. Such forests as China possesses are so far from transportation, that it will take another decade or so of railway construction before their timbers can reach a market. As to the virgin deposits of coal, iron, copper and other minerals, it is better to listen to what mining experts have to say on this subject.

The foremost mining expert of the United States, H. Foster Bain, director of the bureau of mines, expressed himself as follows before the Engineer's Club of Philadelphia:

"The field for the American mining engineer in China, is limited. Notions of great mineral wealth in that country have persisted even since the time of Marco Polo, but they are exaggerated. Some coal of an excellent quality is found, but there is no reason to suppose there are any large quantities of iron ore. One company in China produces about 150 tons of steel annually, although market problems make the situation somewhat involved. What is true of steel is true also of lead, copper, silver and some other ores.

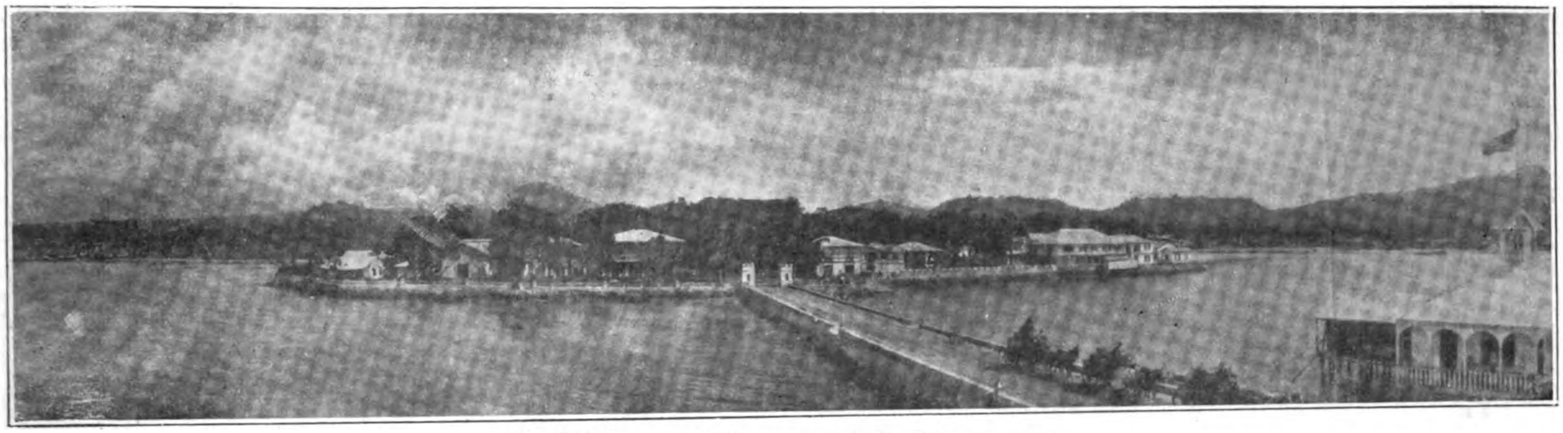
"It is possible a future Klondike may be found in China, but political disturbances interfere with development and the gold is in a region infested by bandits. The largest antimony deposits in the world are in China and, if these are properly developed, that country is capable of controlling the world's supply.

"The future of mining development in China will remain with Chinese engineers, although there is a field there for foreign engineers to make examinations and reports."

This statement is entirely in line with a similar one made by the British commercial attaché at Peking in his 1920 report on the trade of China. The mining possibilities of China have been greatly exaggerated. The concensus of export opinion after careful investigation is unanimous on this point.

Undoubtedly much remains to be done in the development of China's mineral resources and every assistance should be extended to the Chinese in their exploitation, but the great expectations that foreign capital will control this industry should be discouraged until the Chinese show some disposition to remodel their laws and permit foreigners to direct their investments in this field of industry. This disposition, however, is slow in manifesting itself. On the contrary, the tendency is to develop the mining resources of the country by native capital, which is amply attested to by the number of mining permits issued by the government at Peking and the increasing demand for mining machinery from these native concerns. The *Mining Journal* of London, in commenting on the survey of the industry as presented at a recent dinner of the China institute of mining and metallurgy, says :

" One of the most important directions in which China will be influenced by the possibility of modern industrialization will be in connection with the mineral industry. There is apparent a considerable amount of parallelism between the position in China and in India. In either case there are vast populations offering an abundance of cheap, if unskilled, labor, and untapped markets for an immense variety of things which have become necessities of life in other countries, and which the Chinese have shown every desire to acquire when the means are placed within their reach. In both cases the leading mining possibilities are in connection with coal and iron and the industries which subsist upon this combination. A country which is already producing between 20 and 25 million tons of coal and some 2 million tons of iron ore is worthy of attention ; and where China differs from so many of the newer fields of mining and industrial enterprise is that no limit can be set to the extent of development of future years such as is suggested by an examination of colonial fields where the productive and consuming power of the individual is already perhaps rated more highly than in the great industrial centres of Europe. Steady progress is already being made in the organization of a mining administration, and it would seem, at any rate, as though the officials were endeavoring to work on lines approved in the big mining countries of the West. Very possibly these efforts are still somewhat academic and have not taken any real root in the life of the Chinese, but when a start does take place in China, progress is often rapid. China, to-day, governs the wolfram industry and, to a large extent, antimony also. Chinese policy of late has dictated that mining and associated enterprises shall be, in part, national in consitution, and on account of the local complexion of such enterprises we hear less of the development of which is going on than if the work was undertaken by companies registered in this country. The development of the mining industry in Japan, since the Chino-Japanese war, has been extraordinary. If Japan, with a population of 45 millions, can do so much, the potentialities of the mineral industry in China are difficult to compute.



The Old Town of Jolo, capital of the Sultan of Sulu

The Sulu Archipelago

Its Natural Resources and Opportunities for Development

By P. J. Wester, Agricultural Advisor

THE Sulu Archipelago is a group of islands located between 119° and 122° east longitude and between 4° and 7° north latitude, extending in a southwesterly direction from Basilan to Borneo, bounded by the Sulu Sea on the north and the Celebes Sea on the south and east. The entire length of the archipelago is approximately 137 miles, and it includes about 130 fairly large islands, most of which are inhabited, and some 170 islets and reefs chiefly of geographical interest. The Sulu archipelago has an estimated area of 1,030 square miles and a population of 156,212 inhabitants according to the census of 1919. All the larger islands in the Sulu archipelago are of volcanic origin, and their location and the topography of the sea bottom suggests that they may have been the connecting link of a continent extending from Mindanao, the Visayas and Luzon in the northeast, to Borneo in the southwest.

The Sulu archipelago is usually considered in two large groups, the Jolo group and the Tawitawi group. These two agglomerations are again divided into 13 small groups, is as follows :

The Samales group ; the Jolo group (Jolo is the largest island in the archipelago ; and here Jolo, the provincial capital, is located) ; The Pangutaran group ; the South Jolo group ; the Tapul group ; the Kinapusan group ; the Tabuan group ; the Tawitawi group ; the Sigboye group ; the Tataan group ; the Sibutu group ; the Pearl Bank group and Cagayan de Sulu group.

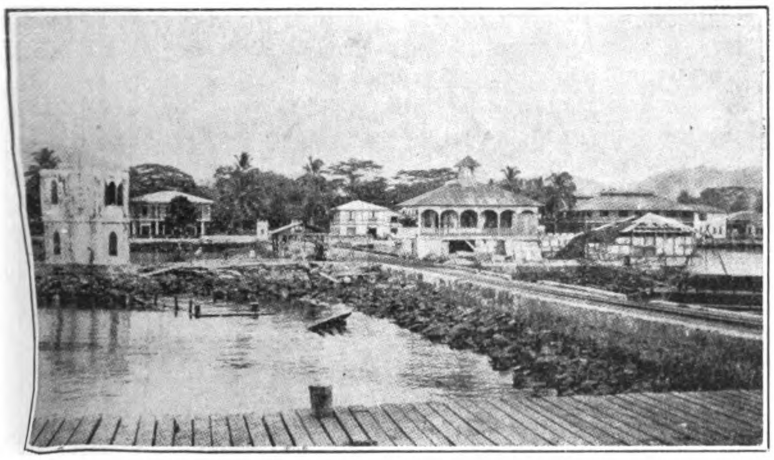
The majority of the smaller islands and reefs are coraline and the approach to many of these is very dangerous and difficult because of the shallow water and the narrow, tortuous channels between the reefs.

Among the islands worthy of more than passing mention : Bakungan is a precipitous, densely wooded island about one mile long and half as wide, located about 11 miles east of Jolo. The inhabitants are occupied principally in fishing.

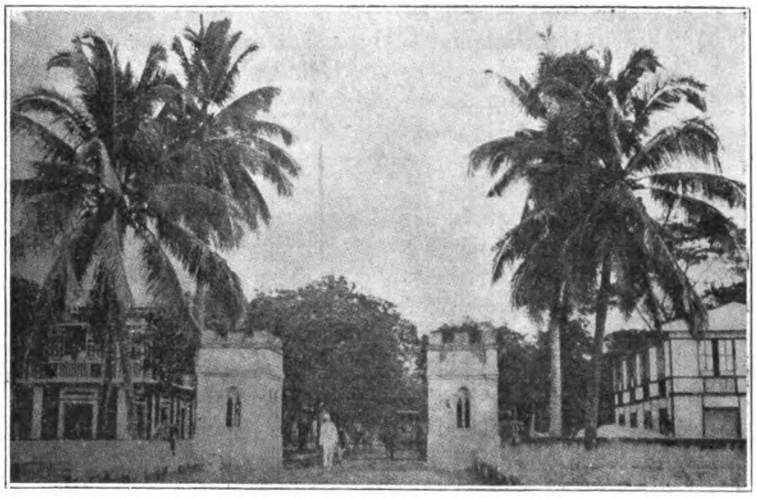
Bongao is a small, rocky island off Sanga-sanga, with good anchorage. The precipitous mountain of the same name is about 340 meters high and a striking landmark from a great distance. Farming and fishing are the principal occupations of the people. The town has a small dock approachable by a good-sized launch.

The little Island of Buan, located about midway of Tawitawi on the south side is difficult of access and can be approached only by small motor boats and vintas. It is mentioned because of its numerous springs from which water is obtained by the inhabitants on the neighboring islands. The principal occupations of the population are fishing and farming.

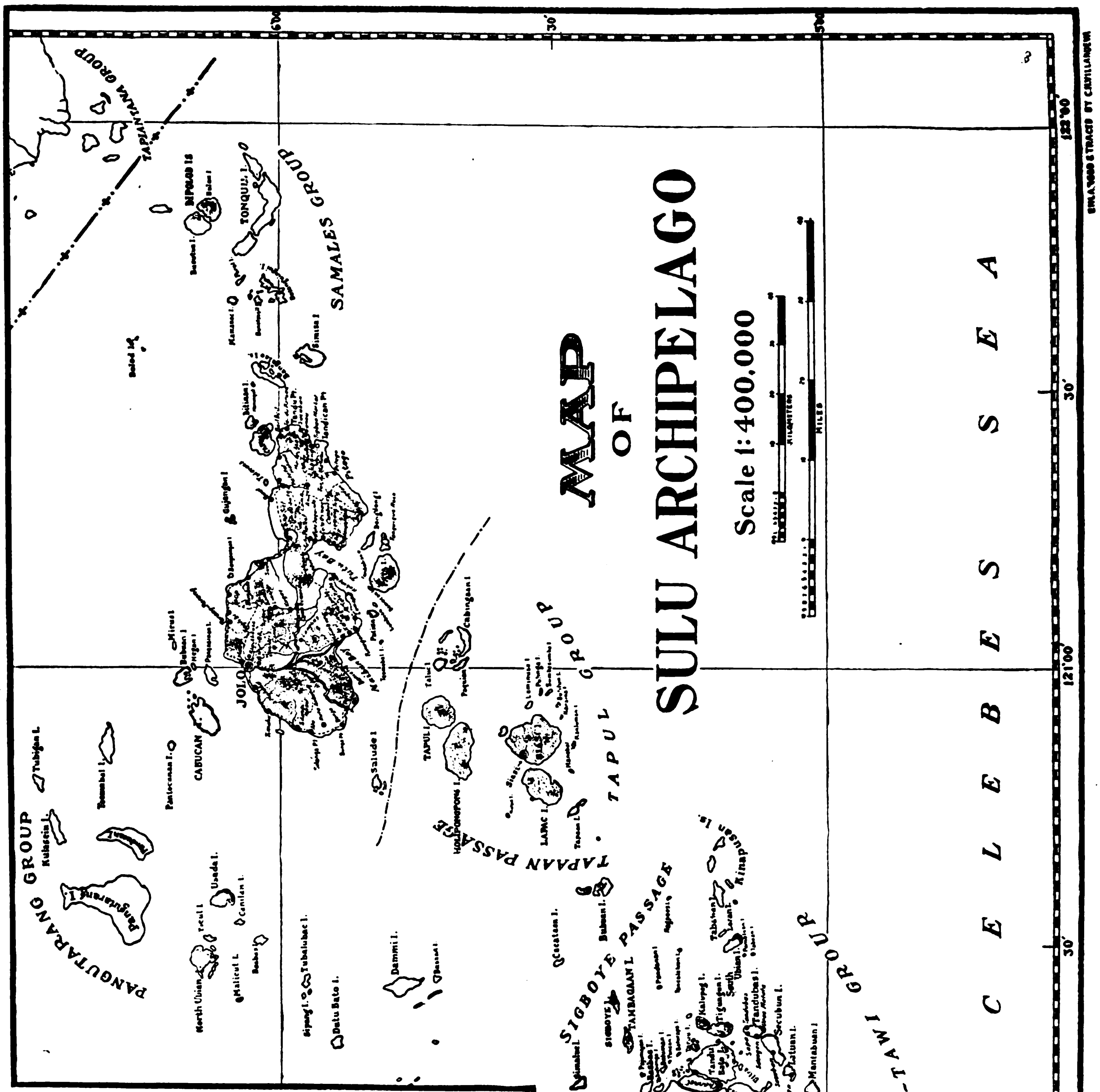
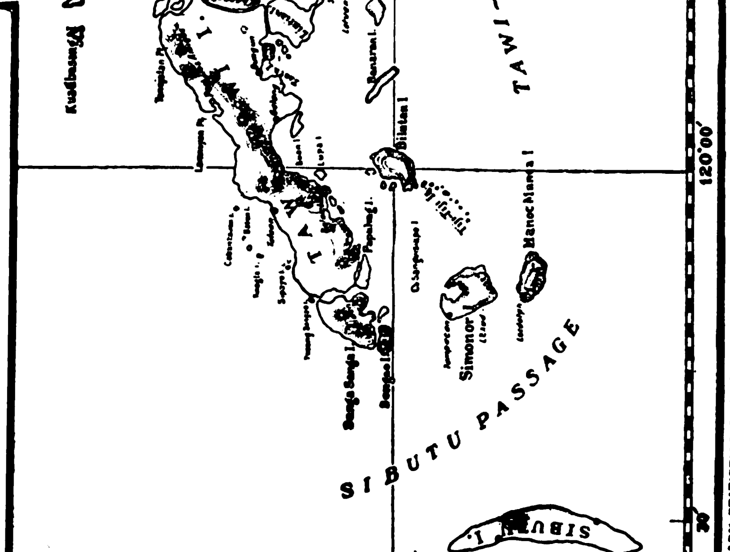
Cagayan de Sulu is about 8 miles long and 5 miles wide, and well elevated above the sea, culminating in a mountain 330 meters high. The island has two small, deep lakes near the south coast and many springs with excellent drinking water. The anchorage at the dock is very good. The island is very fertile and considerable



A view of the Town of Jolo from the Landing Stage



Old City Gate to Jolo as viewed from the Landing Stage

copra is produced; cattle and edible bird nests are other export products.

The Island of Jolo extends from east to west in its greatest dimensions. It is about 60 kilometres long and 23 kilometres broad at its greatest width, with a narrow neck in the middle approximately 6 kilometres wide, again widening at both ends of the island. There are several mountains of considerable height, but the rise of the land is so gradual that the mountain sides are largely available for agricultural purposes. While by far the greater part of the forests were long ago cleared away there are still considerable areas in forest of which teak is the most valuable.

The landscape of Jolo is extremely pleasing, with its general configuration of a series of mountains and hills of gentle slope rising out of the sea, undulating hills and valleys, mostly cultivated, or overgrown with cogon and other grasses.

Port Tulayan, to the east of Jolo on the north coast, is the best harbor on the island and possibly may some day become of importance.

Jolo, the provincial capital of the Sulu archipelago, is located on a wide bay on the north side on the western end of the island. The city is connected with Zamboanga by cable, and has a local telephone system reaching out to several of the more important island villages. The road system on Jolo is rather incomplete, though one may reach Maibung, Parang, Indanan and Camp Romandier by auto.

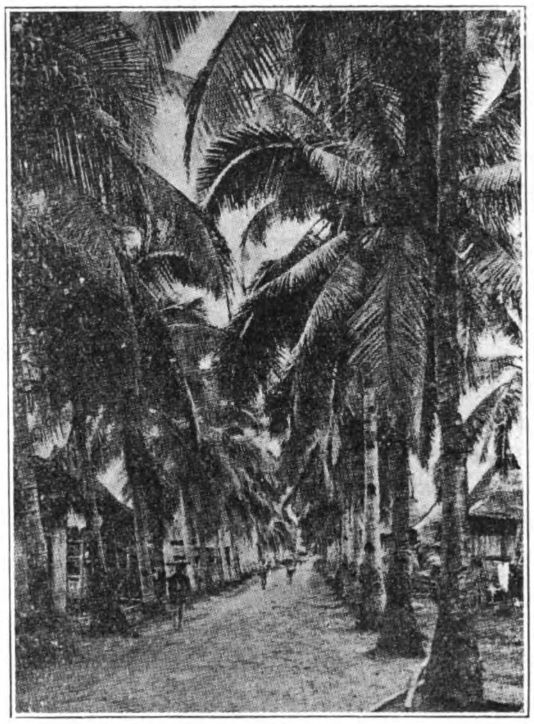
The *Islas Filipinas* calls from Manila and Zamboanga twice monthly and there are monthly steamers between Singapore, Sandakan, Borneo and Zamboanga which call at Jolo in passing that port each way. Various smaller craft maintain additional communication with Zamboanga and the Sulu island ports of Siasi, Bongao, Sitanki and Cagayan de Sulu, where there are small docks.

Laminusa is a small, low coral island about a mile long largely covered with mangroves. It has a good anchorage but poor water, and is mentioned chiefly because of its pearl and trepang fisheries. Excellent mats are made and exported from Laminusa.

Laparan is a low coral island some seven miles long, in the interior of which is a large lagoon about three miles long. The island has no water and is uninhabited.

Lapak is located across the narrow channel from Siasi and has good anchorage on the north and south coasts. The water, obtained partly from springs and partly from wells, is good. Farming and fishing are the principal occupations of the people. Some copra is exported. Lapak is nearly five miles long and three miles wide, with two mountains at the opposite ends of the island, the one in the north 300 and the one in the south 450 metres high, with a wide plain of good to excellent agricultural land in the middle, practically all uncultivated and overgrown with cogon. Attempts have been made by American planters to grow rubber and cassava on this island but all of them have failed.

Lugus is about four and a half miles long and three miles wide, with a good anchorage on the northern and the west coasts. The land formation is a series of fertile hills rising to one peak about 290 metres in height. There are two small lakes on the island but the drinking water is poor and brackish. The population subsists by farming and fishing, the island being quite well cultivated. Copra is the principal export article.


A Road in Jolo

Mantabuan is a small, flat, quite populous island to the south of Tawitawi, with a good anchorage in the channel between it and Latuan island. The population is occupied principally in fishing. Some trepang and shells are exported.

The little Island of Manubul, located a little way from Lapak to the southwest is one of the fishing centres of the Sulu archipelago, exporting dried fish, shark fins and trepang. The anchorage is good but there is no drinking water on the island.

Manukmankau is a flat coral island about two miles wide and twice as long lying a little to the south of Simunul. The anchorage is poor. The drinking water is of fair quality and is obtained from a small pond in the centre of the island. The people are occupied principally in farming, especially in growing a tobacco which by the Sulus is preferred to all other kinds. Some rattan mats and pottery are also made for export.

Pangutaran is a low, flat coral island some 10 miles long with good anchorage, but having very poor drinking water. Farming is the principal occupation of the inhabitants who export copra and cattle.

Panducan is a low coral island, some 6 miles long and about 2 miles wide, located about 23 miles northwest of Jolo. The people are occupied chiefly in farming. Copra, cattle and mats form the articles of exports. The anchorage is good on the south coast. The drinking water is very poor.

Pata is an almost circular island of volcanic origin about four and a half miles in diameter with a mountain in the centre some 330 metres in height. Pata has a good anchorage and good drinking water from springs. The island is well elevated above the sea, the soil is fertile, and most of the land is under cultivation. Copra and cattle are exported.

Sangasanga is an island about 6 miles long located between Tawitawi and Bongao, the population of which are occupied chiefly in farming.

Secubun is a small, low flat coral island with poor and brackish water, the inhabitants of which support themselves by farming and fishing. Dried fish, trepang, pearl and tortoise shells and copra are exported from Secubun.

Sibutu is a long, narrow island some 16 miles long and perhaps 4 miles at its greatest width, lying southwest of Bongao and only about 25 miles from Borneo. The island is partly of volcanic origin, partly coralline. The people are occupied chiefly in farming and cattle raising though some dried fish and trepang are exported. The cutting of railroad ties is the principal industry.

Simunul is a flat rocky island south of Bongao about eight kilometres in diameter. There is no good anchorage off this island and the water is good, being obtained from springs in the centre of the island. The exports are principally pearls, shells and trepang. Wild hogs are quite numerous and there are many wild carabaos descended from escaped domestic animals, most of the island being tilled. Chongos Bay on the southeast coast is a good harbor.

Siasi is an almost circular island of volcanic origin some 10 miles in diameter located 37 miles southwest of Jolo, and is the third most important island in the Sulu archipelago. There is a gradual and even slope of the land from the sea to the top ofMount Gorra in the centre, attaining a height of 400 metres. The soil is fertile and the land is largely cultivated up to the mountain top or overgrown with cogon. The town of Siasi has a good anchorage and is equipped with a water system. The water, which is excellent, is obtained from springs on the higher slopes of the island. The inhabitants are occupied chiefly by farming and fishing, and copra, abacá, cattle, dried fish, shark fins, trepang, pearls and shells form the export products.

There is a small ceara rubber and robusta coffee plantation in Siasi owned by an American corporation. Local industries include mats, pottery and shell bracelets.

Sitanki is a small island and seaport southwest of Bongao and west of the south end of Sibutu with a good anchorage, but all drinking water is obtained from Sibutu. Some dried fish, trepang and shark fins are exported.

South Ubian is a small, low and flat coral island about 64 miles southwest of Jolo with a good anchorage, but having very poor, brackish water. South Ubian is one of the most thickly populated islands in the archipelago and is well cultivated. Pearls and shells and trepang are exported from South Ubian.

Tandubas is a small island southeast of the east end of Tawitawi. Agriculturally the island is of no importance but it is quite populous, the inhabitants being occupied with fishing. Pearls and shells and trepang form the chief exports. The anchorage is good on the east coast of the island opposite the town of Ungas Matata. The drinking water is poor and brackish.

Tapul is an island of volcanic origin and with a good anchorage, located about 25 miles southwest of Jolo, the highest peak rising to an elevation of 500 metres. The island is nearly circular and about eight miles across, with springs in the interior that provide good drinking water. The greater part of the island is under cultivation and it is considered as one of the most prosperous in the archipelago. Excellent mandarins are produced. The exports include coconuts, hemp, citrus fruits, pearls and shells, trepang and dried fish, and some cattle and horses.

Tawitawi is the second largest island in the Sulu archipelago, being some 35 miles long and 13 miles broad at its greatest width. Unlike Jolo, Tapul, Siasi and Lugus, which are well adapted for agricultural purposes, the topography of Tawitawi is very broken, rough and mountainous with a range of mountains extending throughout its entire length of which several peaks rise at 300 metres or more, one, the Bihabiha, attaining a height of 580 metres. Several small rivers or, more correctly speaking, streams, find their way from the interior to the sea; of these the Dungun and Malum Rivers are the largest in the Sulu archipelago. The anchorage on the north coast is good, which is also true on the south coast as far as the town of Balimbing. Drinking water is good and plentiful. Nearly the whole island is covered with dense forest which as yet is largely unexplored. Some railroad ties are being cut and shipped out of the island, but because of its mountainous character Tawitawi will never attain any importance agriculturally.

Tonquil is a narrow, crescent-shaped, flat coral island about 10 miles long located south of Basilan and east of Jolo, with a good anchorage but poor, brackish water. A large part of the island is covered by mangrove. The exports include dried fish, trepang, pearls, shells and copra.

To the traveler with a love and appreciation of scenic beauty, picturesque surroundings and a study of the primitive, simple life, sufficiently spiced with danger to render the experience more fascinating than an ordinary outing, a cruise through the Sulu Sea is certainly to be recommended.

Next to Jolo, Siasi is the most important trading centre in Sulu. The anchorage is good and the channel between Lapak furnishes a reasonably safe harbor. The soil is fertile. Also, a large part of the island is under cultivation.

Climate

The climate of Sulu is mild without violent changes in temperature. The nights are always cool.

The rainfall is plentiful and equally distributed throughout the year.

Population

The population of Sulu, numbering 156,212 souls, is greater than that of any province in the department of Mindanao and Sulu, though in area it is smaller.

Tribally the population may be divided into three groups. The Sulus are the most advanced of the native inhabitants, who, before the advent of the Spaniard and American, were the ruling people of Jolo. The Sulus constitute the agricultural population of the archipelago and from them are largely recruited the labor employed in cutting railroad ties, the one industry in Sulu in which Americans are engaged. They are also engaged in fishing and pearling.

The Samals are, together with the Bajaos, in the majority on the smaller islands and on the coasts of Jolo. Both make their living from the sea, and while the Samals are somewhat more advanced in civilization than the Bajaos, there is really very little difference between the two tribes. The agriculture engaged in by the Samals is of the crudest form, while the Bajaos prefer the sea altogether. The Filipinos in Sulu are very few and of the white race there are still fewer representatives. The Chinese trader in Jolo, Siasi, Bongao and Sitanki one may not escape any more than in any other trade centre in the Philippines. He is the almost indispensable link between the farmer and fisherman and the export houses in the centres of trade in the Philippines.

Agricultural Industries and Food Crops

The agricultural practices in Sulu do not differ materially from those in the other regions in the Philippines, and production per unit area could be greatly increased by more modern methods of culture.

Abacá, the principal product of Sulu, is grown chiefly on the island of Jolo; the quantity of fiber produced on the other islands is negligible. Soil and climate both are well adapted to abacá over a large area of Jolo island and the area planted could be increased very considerably, especially in the interior. However, the extension of the abacá plantations may well be left to take care of itself. The more urgent measures are the education of the Moro farmer in the need of more thorough preparation of the land before planting, better cultivation and instructions in stripping and grading of the fiber.

Copra constitutes the second largest export article of Sulu but it will unquestionably supersede abacá within the next few years. Most of the copra is probably produced on Jolo island though there are few inhabited islands where coconuts have not been planted. On the outlying islands the largest number of coconut trees are found on Tonquil, Pangutaran, Bangalao and South Ubian. However, the nuts are, to a great extent, consumed as food in the localities where they are grown. In systematic planting and care of his trees the Moro appears to be behind the Filipino planter in the Visayas and Luzon, in fact, it is doubtful whether there are any, even small plantations, regularly spaced or otherwise properly cared for, and there is a crying need for far advisers to set the people right in these respects. This is equally true in regard to control measures for beetles and weevils. To no other crop are the numerous coral islands so well adapted as to coconuts and too much could not be done to encourage the extension of coconut plantations on these islands.

Cattle raising is another industry that goes well in hand with coconuts on the larger islands where good water is available. It is especially worthy of attention considering the isolation of the islands and the ease with which diseases can be kept out of this region.

From the export figures, it might be inferred that rice beyond the needs of the population was produced, whereas the rice imports rose to P.900,000 worth in 1918. Several varieties of upland and lowland rice are grown, upland rice predominating. Most of the rice is grown in Jolo.

In 1918, there were 20 small sugar mills in operation in Jolo but these of course were all of a very primitive type and the quantity of sugar produced was insignificant. Considering how well adapted to coconuts, coffee, rubber and abacá Jolo Island is, and how well occupied the land in small holdings by the present population, there does not appear to be much room for a sugar industry and it is probable that land now planted to sugar cane could be far more profitably occupied by other crops.

Corn is not of especially great importance as a food crop in Sulu. Cassava is very extensively grown, there being possibly a greater area planted to cassava than to any other single crop. Camotes, ubi and gabi are also grown to some extent. Other crops of less importance are borona, sesame and adlay.

The more popular vegetables include patani, squash, patolas, pepinos, tomatoes, watermelons, chili and kankong. Sago is made from the sago palm.

Fruits

Jolo is noted for its many fruits, and the climate and soil are very favorable for fruit culture. Mangosteens, baunos, marangs, huanis, durians and rambutans, unobtainable nearly every where else in the Philippines, are abundant in Jolo, in addition to many other fruits, such as the lanzon, bulala, papaya, banana, jak, etc.

Forest and Forest Products

At present there is only one sawmill in operation in Sulu; it is located in Jolo.

Properly developed the forest products of Sulu should become a very important source of revenue. Public commercial forests are located on Tawitawi, Sibutu, Sangasanga, Simunul, Manukmankau, Lintian, Tandubatu, Basbas, Tata, Ampoy and Tabulunga. These forests contain much the same timbers as the forests in other parts of the islands, both hard and soft wood, such as: ipil, *intsia bijuga*, *pahudia rhomboida* and *adenanthera intermedia*; yakal, *hopea* spp., *isoptera borneensis*, and *shorea balangeran*; calantas, *toona calantas* and *azadirachta integrifoliola*; lumbayao, *tarrietia javanica*; guijo, *shorea guiso*: narra, *pterocarpus indicus* and molave, *vitex parviflora* and *V. pubescens*.

The only commercial teak forest in the Philippines is located in Jolo, being some 2,500 hectares in area. This is now being logged by the province on a small scale. The most important forest product is railroad ties. Almaciga formerly was collected in considerable quantities but production dropped off to a negligible quantity during the past year. Gutta-percha and gambier have never been collected in appreciable quantities. Some tanbark is obtained and this is an industry that could be increased very considerably. Some lumbang nuts are collected and exported. The archipelago produces a small quantity of cinnamon. These minor products will never attain much importance, but lumbering, the cutting of railway ties and the collection of tanbark are capable of development into industries of considerable magnitude.

Mining

There are no mining operations in progress anywhere, though manganese has been discovered on various islands and gold has been found in Jolo. Oil has been reported from Siasi but no attempt has been made to make borings. It is quite possible that the manganese deposits are large enough to be worth investigating considering that, according to analyses made by the bureau of science, the ore contains 62 per cent. pure manganese.

Marine Industries

Pearls, pearl shells, tortoise shells, fresh and dried fish, trepang and shark fins constitute the marine products of Sulu.

The shark fin industry has been of steady growth, but no effort has been made to make oil from the shark livers and guano from the sharks themselves. Diving and fishing for pearls and shells is one of the most important industries in the Sulu archipelago which produces most of the shells and pearls for export from the Philippines. Moros as well as Japanese and Chinese are engaged in this work.

There are many sponge beds in the Sulu archipelago and several attempts have been made to engage in sponge fishing, which, however, has been abandoned within the last three years. The sponges are reputed to be of good quality. Failure to cure them properly is said to have caused their arrival in the United States in bad order.

Trepang fishing could undoubtedly be engaged in on a far greater scale than at present, which is probably also true of tortoise catching. It is of interest to know that young tortoises are frequently caught and kept in captivity for several years before they are killed. One of the curious sea products of Sulu is the so-called "sea horse," a small animal with head and neck like a miniature horse, which is dried and exported to China because of its supposed medical value.

Prospective Industries

With few exceptions the development of the industries of the Sulu archipelago would appear to lie in the hands of the present inhabitants, and opportunities for investment by big capital are not many. There is unquestionably much timber, especially in Tawitawi, but the broken topography of that island would probably make transportation of logs from the interior to the sea more difficult and expensive than in other parts of the Philippines. Railroad ties can be brought out more readily, and this industry may be expected to expand during the next few years. Considerable teak may be expected in the market from the government reservation but owing to the small area of this forest no very great output can be anticipated for more than a short period. Whether the pearl beds are so extensive that a larger pearling fleet could find profitable work is doubtful. On the other hand it would appear that a well organized sponging outfit, prepared to properly care for the harvested material and place it on the market would be profitable. The value of the pearl and sponge fisheries might be greatly enhanced by the judicious planting of new beds.

As the shark fin industry grows there would appear to be room for a small guano factory to take care of the shark meat and to prepare the oil from the livers that is practically a total loss at present. It is not generally known that shark liver oil is very similar to, and can be used for, all the purposes for which cod-liver oil serves.

Broadly speaking, the great agricultural export crops of Sulu will always be copra or coconut oil and abacá. The plantations will be small and probably always remain in the hands of the Moros. There is not sufficient public land available at any one point to induce the American and European with his heavy overhead expenses to engage in coconut growing in this part of the world, considering how much more favorable for plantation ventures all conditions are in Mindanao and Basilan. The same, is, of course, true of para rubber. Coffee is well adapted to native culture and on Jolo there are numerous streams that could be utilized in preparing the coffee, so that there is no reason why, with the adoption of a more diversified system of farming by the Moros, coffee should not become a crop of some importance. In some sections there is excellent tobacco land.

Much land within a radius of eight kilometres of Jolo that is too shallow for other crops could, to advantage, be planted to pineapples, and a cannery in Jolo would be at the same time within easy reach of the plantation and of the wharf, and it might in part be employed for canning fish.

In fine, a region of unsurpassed scenic beauty and romantic interest, inhabited by a virile race of picturesque, interesting people, the Sulu archipelago, with an older authentic history than any other part of the Philippines, is of unusual interest to the traveler and tourist. Already quite densely populated, Sulu offers but little inducement to the investment of big capital, especially along agricultural lines, and apparently is destined to be developed chiefly by her sturdy native inhabitants.

ERRATUM

Mr. Oei Tjoe

On page 147 of the March issue lines 32 and 33 should read:—

A native of Amoy, he went to Java to learn the sugar business, and in the course of time invested his earnings in sugar properties.

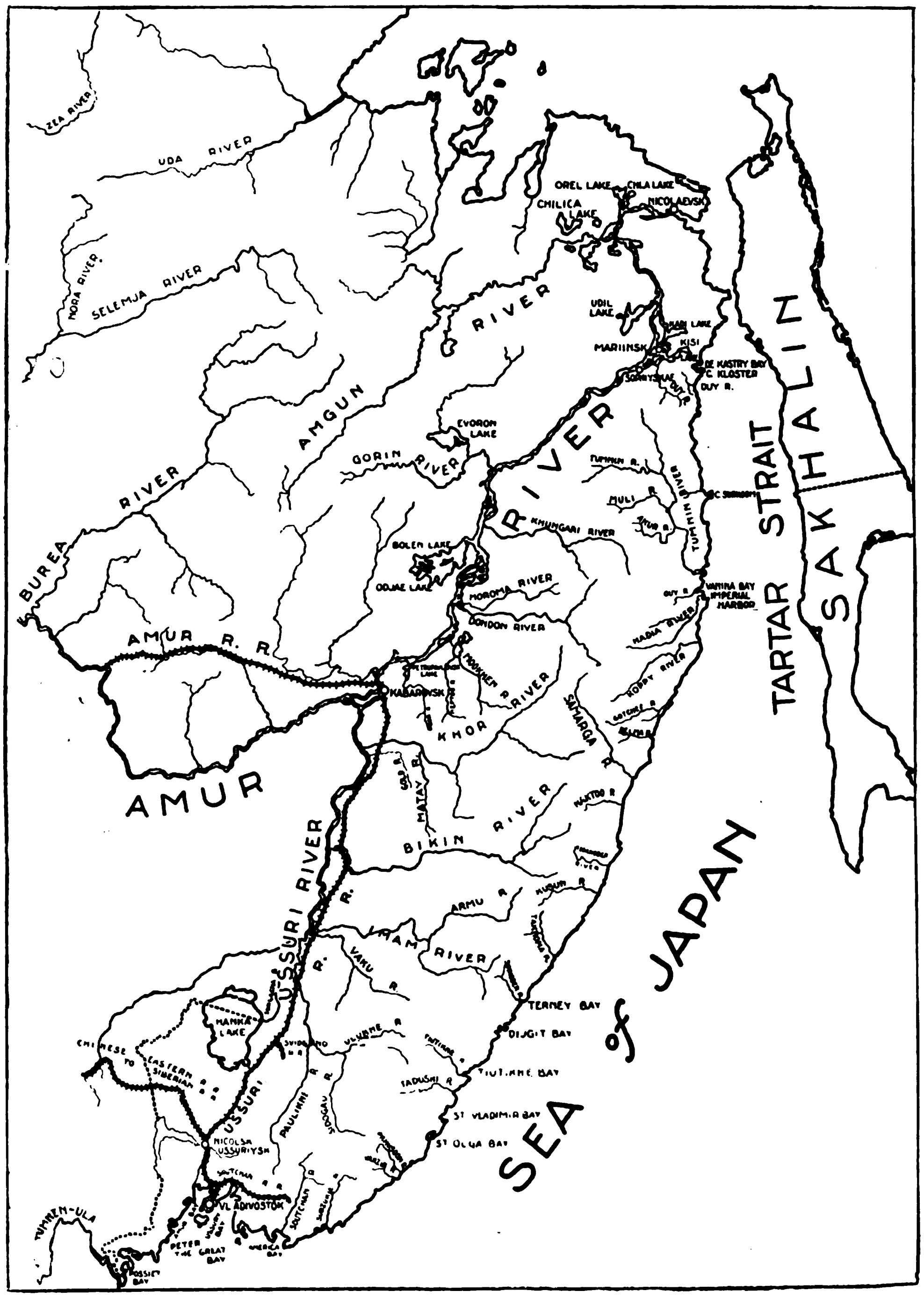
Russian Timber Industry

By W. Jacob in "The Timberman"

IN the month of July the working year of the chief timber committee came to a close. The operations of the committee had been carried through under most difficult conditions and discouraging circumstances. The months of January and February were characterized by a fuel crisis; when it became necessary to rely on the removal of timber in order to maintain traffic on the railways, and to slow down the preparation of timber, which of course produced its effect of later operations in respect to a reduced removal of goods in March and April. On the other hand the severe crisis in provisions was keenly felt throughout all the operations of the chief timber committee and its local organizations.

To these leading factors that interfered with the success of operations during the working year 1920 1921 must be added a purely meteorological factor resulting in the low level of the river waters through the absence of rain, which made floating difficult, and reduced both the period of time and the geographical limits within which it could be done; for on a great number of small rivers on which under ordinary conditions timber could be floated in the spring time, such could not be done last spring. All these factors influenced the issue of the timber operations discouragingly, reducing the quantity prepared and consumed. Only with incredible exertion and close organization both on the part of the chief timber committee and its local organizations, accompanied by the development of every energy and initiative was the timber business, closed in the working year named, more or less satisfactorily, to the extent of 70 per cent. of the program that had been marked out.

According to data, not altogether complete, affecting the preparation campaign 1920-1921, the quantity of firewood prepared was 9,500,000 cubic sagens (one cubic sagen equals 343 cubic feet) and the quantity removed was eight million cubic sagens; and the quantity of industrial timber prepared was two million cubic sagens and the quantity removed 1,200,000 cubic sagens. Thus the total quantity of timber prepared in some form or other was 11,500,000 cubic sagens and the quantity removed was 9,200,000 cubic sagens.



Map of the Amur River Basin, the Great Lumber Centre of Eastern Siberia

Such is the result of the timber industry in the preparation of and provision of fuel and timber materials required. In the wood-working industries there were 1,100 factories engaged, running 1,900 frames; and 550 factories with 980 frames were idle. The product of work done in the sawmills during the past working period, from October 1, 1920, to May 1, 1921, according to the reports of 37 local organizations (the others not having supplied full particulars), was 42,840,000 cubic feet. But taking the whole yield for the period as 46,500,000 cubic feet, which is believed to be correct, the program marked out for these mills was exceeded by 8.5 per cent.; that is that the total production amounted to 108.5 per cent. of the quantity required of them by the chief timber committee.

Export Situation Becoming Normal

The export operations during the working year under review were most effectively carried out on the western Dwina, at Riga, to where 165,000 logs were directed. The export of sawn timber is gradually becoming regular, and at the present moment in the neighborhood of Petrograd there are about 300,000 standards of export timber. Recently the Soviet foreign export committee has been actively engaged arranging for the shipment of this timber.

The timber program for 1921-22 is closely governed by these results as attained in the past working year, and the resources that may be anticipated for the current year.

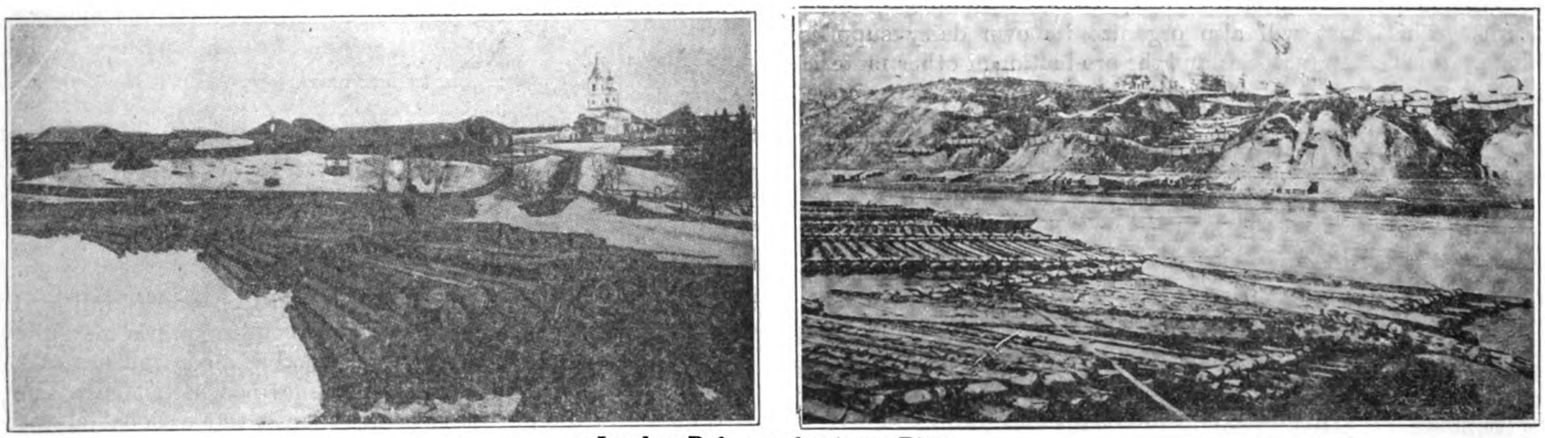
Thus it is proposed to prepare and remove for government requirements, firewood, etc., to the extent of 10,500,000 cubic sagens, and industrial timber to the extent of three million cubic sagens, or a total of 13,500,000 cubic sagens. For the execution of this program there remain along with the timber prepared in previous years in the forest, up to seven million cubic sagens which are to be considered the basis of timber supply, from which dry firewood is to be drawn for requirements in the course of subsequent working years or periods. Relatively the heaviest burden will lie on the governments of Viatka, Perm, Uphim, Simbirsk and Nizhegorod, which have been struck by the bad harvest; and this may of course necessitate the program of distribution to be lighter on these governments and the difference to be made up by other governments. Besides the program mentioned, the chief timber committee has planned a regular preparation of 15 million sleepers for the railway department. To execute this program the timber committee has formed a special sleeper section.

A Siberian Forest

doing all it can to provide for this supply.

The next most important consumer of timber is the mining industry, for which large quantities of props are required. The preparation of mining timber is worked out in a plan, and is distributed per region and government, to produce a total of 180,000 cubic sagens of oak and coniferous wood. The total quantity provided for in the 1921-1922 working year in respect to the inland market is a little over 110 million cubic feet and the total quantity arranged for in the same period for factories working for export is a little over 15 million cubic feet.

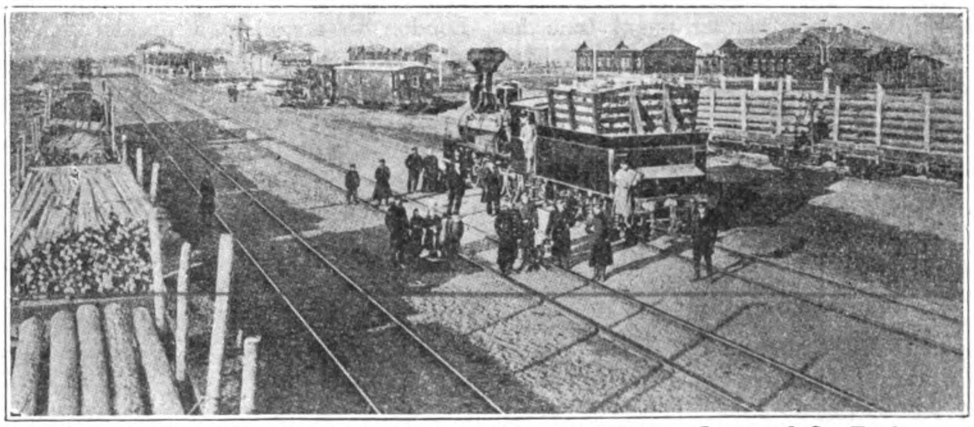
The chief timber committee is devoting particular attention at the moment to this question of export, which is recognized as an urgent department of business, not only because it helps to strengthen the industry itself and to insure its further development, but also because it furnishes the public with the means to purchase other kinds of fuel and thereby improve the fuel budget.



Lumber Rafts on the Amur River

Sleeper Districts Formed

Separate sleeper districts will be organized, where both the supply of the timber and its cutting at the factories will be specially superintended; and local organizations will be invited to assist. The next most important consumer in a government sense is the supplies (provision) committee. Here it is a question of packing materials, including the cooperage industry, which is mostly concentrated on the Caspian Sea; but later it is proposed to take measures to develop it on the shores of the Black Sea. Until now the cooperage industry on the Caspian Sea has been occupied mostly in providing tare for the fishing industry. For the moment this work is hindered by the limited supply of raw material for making casks, and the famine in the district, where it ought to be carried out, namely the Tartar Republic and along the River Vetluga. The chief timber committee is



Where the Wood Burning Locomotive Hauls Long Trains of Logs and Cut Timber for Building the Cites of Siberia

North Russian Timber Trust

A timber trust has been formed in North Russia under Soviet government auspices, the duties and rights of which are very extensive, including a control of both old and new timber concerns; that is, concerns that are served by the White Sea ports. Mr. Liberman, who is the managing director of this trust, in an interveiw with a Latvian journalist, said that the board of the trust is composed of experienced people, which assures it of competent guidance. This trust, which goes under the name of "Severoles," operates in a district that works almost entirely for foreign markets. And for food supplies and such like it will even depend for some time on foreign sources. The trust will operate with considerable freedom from government control; but is obliged to set apart 20 per cent. of its revenue every year for equipping and developing the northern district. The resources of this

trust are listed as follows: The area handed over to it by the government makes about 30 million dessiatines of forest land, and the number of saw frames already in the area is 180. It has received the requisite funds to buy up the sawn wood in the area under its control, which it is under obligation to realize on the foreign market. In material means the trust is fully assured and it can begin work at once.

At first it will operate with its own means and start the 180 saw frames; but it will endeavor to make terms with foreign capital, for the 180 frames referred to can barely deal with a quarter of the timber resources at the disposal of the trust.

Mr. Lieberman suggested several ways by which foreign capital might share with the trust in the development of Russia's northern timber lands. He insisted that there is plenty of room in Russia for work and that foreign enterprise may take a hand at once; therefore the question of granting concessions for the erection of new concerns is an immediate one. He had every confidence in the success of the big concern at the head of which he stands.

Talking of the timber ready for export he said that of 130,000 standards available 50,000 standards are ready to be shipped. The program of operations for 1921-1922 has already been drawn up. He has been put in possession of ample funds for the importation of the necessary provisions until navigation closes, and the first steamers bearing such provisions from abroad are already on the way to Archangel.

The establishments handed over to the timber trust include two rope works with all their raw material, and one textile factory with 175,000 poods of prepared flax, besides a number of other concerns. This trust will also organize its own dairy supplies, fishing stations, soap factories and the production of other material for the chemical treatment of wood, the product of which will also be exported abroad.

Japan Oil Reserves

THE Japanese navy which recently contracted to purchase from the Asahi Petroleum Company 400,000 tons of crude oil for fuel purposes still needs 100,000 tons more to use this year and after receiving bids from the Asahi Petroluem Co., Suzuki & Company, the Asano Bussan Kaisha and the Mitsui Bussan Kaisha, have decided to purchase the lot from the last named company for Y.30 per ton. It is said that the Mitsui Bussan Kaisha intends to import most of this oil from California.

Coincident with the placing of this order, it is reported that the naval office will give contracts for the shipment of foreign oil to private companies in order to protect the private-owned tankers. Such tankers as possessed by private firms are the *Tachibana Maru* and the *Manju Maru,* each 3,800 tons, all property of the Teikoku Oil Company, and the *Kiyo Maru,* 13,000 tons, of the Toyo Kisen Kaisha. The *Tachibana Maru* and the *Manju Maru* are now engaging in the transportation of oil from the Persian Gulf to Japan for the company's exclusive use, but upon the prospective merger of the company with the Asahi Petroleum Company next June the transportation from Persia will come to a close. At the same time, these two tankers will take up the service of carrying foreign oil for the navy and will proceed to the Californian coast. The steamer freight will be fixed at the neighborhood of Y.12 per ton.

There is every reason to believe that the usual criticisms will now be directed against Japan for purchasing oil from abroad while her natural resources are estimated to meet her demands at the present rate of consumption for 300 years. Some time ago a section of the American press seemed to see in Japan's unusual importation of American and Canadian lumber, sufficient justification for the basis of another war scare while others condemned her for saving her own timber supplies by purchasing abroad. Whatever Japan does seems to have some sinister purpose for some people, and with the recent report on her petroleum resources read before the American Institute of Mining and Metallurgical Engineers, we may expect further condemnations of her policies. The full report has not yet reached us, but a statement issued before the meeting of the above institute summarized the conclusions regarding Japanese oil resources and forecasting the discolsures to be made.

The paper on Japanese oil resources was prepared by Mr. J. Morgan Clements, a well-known mining engineer and geologist of New York, who maintains that "considering her actual requirements, it appears that Japan is more fortunate than most nations in the possession of oil reserves for the future. Her needs in this respect are not a good reason for the island of Saghalien nor any territory on the mainland of Asia. In fact, Japan possesses much more oil than her propagandists have tried to make the world believe she has."

Mr. Clements recently investigated the Japanese oil fields. He is probably the best informed foreign geologist on the oil fields of that country.

If Japan has an oil supply for 300 years, and the United States for only twenty years at the present rate of consumption, it certainly is time for America to begin saving and to back the state department in insisting on the open in all parts of the globe for oil prospecting and exploitation. America has been very prodigal in exploiting her oil reserves for the benefit of the world and the time must be rapidly approaching when exports must be limited unless American capital and enterprise opens up new fields in other countries. If Japan has resources for another 300 years, it would be interesting to learn the opinion of experts on the oil resources of China.

Japanese Pearls Equal to Natural Gems

A FAR-REACHING decision was recently handed down by the French government when Japanese culture pearls were classified as equal to the natural gem, and as a consequence of this decision a suit for 100,000 francs damages has been filed in Paris by a dealer in the Japanese pearls against the national chamber of dealers in diamonds, pearls and precious stones.

In maintaining his stand in the face of the opinion of French scientists that Japanese pearls are not equal in value to the finest natural pearls, the president of the national chamber of dealers in diamonds, pearls and precious stones is confronted with the possibility of having to pay a member of that body 100,000 francs. At the same time the status of Japanese pearls has once and for all product of Japanese ingenuity now ranks with the precious stones of the world.

The long and bitter fight waged by French jewel merchants against the forcibly grown pearls of the Orient was brought to a climax last November when the chamber of dealers refused to permit one of its members to import forty Japanese gems from London to complete a necklace that had been ordered. This member, M. Pohl, had to make his request to this body, as it held the monopoly on the importation of pearls from all countries. The president of the association, in conformity with the opinion held by that body, replied that Japanese pearls were not in the category of gems authorized to pass the frontier.

M. Pohl appealed to the Japanese embassy, which in turn made representations to the finance minister. The minister, after consulting French scientists, immediately classed the Japanese product in the class of fine pearls. In addition to severely criticizing the syndicate, the government withdrew from that body the control over importation of pearls and placed it in the hands of the French customs.

M. Pohl, having won his case, filed suit for 100,000 francs damages because of alleged injury to his business.

Naval Bases, Radio Stations and Cable Communications on the Pacific

By Richard Ernest Lambert, Lecturer on Ports and Terminals, the School of Commerce, New York University, and Former Lieutenant U.S. Navy and Naval Supply and Disbursing Officer, Honolulu, Hawaii

WITH the control of the Pacific one of the fundamental questions being deliberated by the arms conference a survey of the naval bases and communications has its place. From the point of view herein presented, the terms "naval bases" and "naval stations" have not been used in their restrictive technical sense primarily the endeavor rather has been to picture in the broadest way possible all naval factors as far as is possible.

In order that the reader may have in a single picture that part of the strategic background against which the searchlight of the Far Eastern discussions is being thrown, which is comprised of such bases of major strategic importance as naval stations, radio stations and cable stations, a comprehensive list of such stations is given here for all the countries of principal interest. These lists are submitted without any comment, editorial or otherwise, since it is believed that they speak for themselves—and that most eloquently—, and besides it is believed that the reader will prefer in this instance to draw his own conclusions.

In one or two instances, because of their paramount strategic importance affecting Britain's position in the Far East, British stations not strictly speaking located in the Pacific arena, are included.

I. United States

A. NAVAL STATIONS

(1) Main Land of the United States

San Diego (Training Station, Aviation Base, and Marine Base)
San Pedro (Submarine and Torpedo Destroyer Base)
San Francisco (Training Station)
Mare Island (Navy Yard and Torpedo Storage)
Astoria, Ore. (Columbia River Submarine and Destroyer Base)
Keyport, Wash. (Torpedo Storage)
Sand Point, King Co., Wash. (Aviation Base)
Bremerton (Puget Sound Navy Yard)
Port Angeles, Wash. (Submarine, Destroyer, Aviation Base)

(2) Pacific Possessions

Alaska—None developed
Hawaiian Island—Pearl Harbor, Oahu
Philippine Islands—Manila, Ologanpo, Cavite
Guam—Marianas or Ladrone Islands
Pago Pago (Tutuila, Samoa).

While the Panama canal is in no sense a naval base or station, it should be included in any such survey as this present one, perhaps because it is in some respects a United States fortification, but more particularly because of its great importance in any Pacific Ocean study. Therefore we include Balboa, the Pacific terminus and Crystalbal (Colon) the Atlantic terminus of the Canal.

B. RADIO STATIONS

(1) U. S. Naval Radio Stations

Alaska: St. Paul, St. George,—both on Pribilof Island; Dutch Harbor, Kodiak, Cordova, Sitka (old Russian capital) Seward, Juneau (American capital), Ketchikan.

(2) U. S. Army

Alaska: Nome, Fort St. Michael, Kotlik, Wrangell, Craig.

(3) Privately Owned

Alaska: Chicago, Port Moller, Libbyville, Latouche, King Cove.

(4) Alaska Engineering Commission Anchorage

(5) Other U. S. Radio Stations in the Pacific

(*a*) *Mainland:* Keyport, Wash.; Puget Sound (Bremerton, Wash.); Tatoosh Island, Wash.; North Head, Wash.; Seattle, Wash.; Portland, Ore.; Astoria, Ore.; Marshfield, Ore; Eureka, Cal.; San Francisco, Cal.; Point Arguella, Cal.; San Avalon, Cal.; San Diego, Cal.; and Farrallon Islands (off the coast of San Francisco); Mare Island Navy Yard.

(*b*) *Hawaiian Islands:* Pearl Harbor, Heeia Point; Wahiawa; Lihue Kauai; Kawaihae; Lahaina; Kaunakakai.

(*c*) *Philippine Islands:* Fort Mills (Corregidor Island).

Insular Owned: San Jose (Mindoro); Cuyo; Puerto Princess; Malabang; Davao; Zamboango; Jolo and Cavite.

(*d*) *Other Pacific Possessions:* Samoa (Tutuila); Balbao, C. Z.; Guam (Ladrone Islands).

(*e*) *Peking* ("Courtesy" station within American Legation).

II. Great Britain

A. NAVAL BASES

Canada—Dominion: None developed, but potential at Vancouver, Victoria, Prince Rupert (all British Columbia).

Imperial Stations at Hongkong, Weihaiwei, and Singapore. A naval station of first-class importance is located in Hongkong; one of the greatest navel stations iin Asia is to be developed at Singapore. At the fortified harbor of Aden, Arabia, a port of extraordinary strategic importance, a large coaling station is situated. The harbor of Columbo, Island of Ceylon, in the Indian Ocean, is a protective harbor.

Australasia—Commonwealth of Australia: Sydney is a first-class naval station; headquarters of British Fleet in Australasia. New Zealand: Auckland.

B. RADIO STATIONS

(1) *Canada:* Digby Island (Prince Rupert); Gonzales Hill (Victoria); Point Grey (Vancouver); Cape Lozo; Pachena Point; Estevan Point; Triangle Island; Ikeda Head; Dead Tree Point; and eight private commercial stations of minor size—all in British Columbia.

(2) *Australia:* Port Moresby; Thursday Island; Cooktown; Townsville; Rockhampton; Brisbane; Sydney; Finders Island; Melbourne; Hobart; King Island; Mount Gambier; Adelaide; Esperance; Perth; Geraldton; Broome; Roeburne; Wyndham; Darwin; Samarai; Woodlark Island; Cocos Island. Included with the Australia Radio stations should be listed those of foreign German territory now administered by Australia: Rabual; Madang; Nauru; Kieta; Bita Paka; Morobe; Eitape; Manus; Kaewieng.

(3) *New Zealand:* Auckland; Suva; Labasa; Taveuni; Savusavu; Awanui (Auckland); Awarua; Wellington; Chatham Island; Apia (Samoa); Raratonga (Cook Island).

C. CABLE COMMUNICATIONS

Canada: Bamfield, British Columbia.

Australia: Sydney, Melbourne, Adelaide, Brisbane, Darwin, Fremantle, Cocos Island, Southport, Botany Bay, Burnett Heads.

New Zealand: Auckland, Wakapuaka, Wanganui, Doubtless Bay.

Tasmania: is connected with both Australia and New Zealand by cable.

Fijis : Norfolk Island, Fanning Island stations.

Great Britain also has Cable Stations at Hongkong, Penang, Malacca, Singapore, Sandakan.

III. Japan

A. PORTS AND NAVAL BASES

There are more than a thousand Japanese harbors that are visited by merchant men. Of these there are about sixty harbors open to the call of foreign steamers, which include eleven for Formosa and ten for Korea. Of these sixty, thirteen stand out most prominently from the standpoint of harbor improvements, reclamation or dredging. Of the thousand harbors, three hundred and fifty are used by coast steamers and thirty-six are known as open ports. Two are known as fortified ports and four as naval bases. It is these last six in which we are particularly interested.

The two fortified ports are Shimonoseki and Tsushima. The complete Japanese coastal defense program includes also fortifications to be constructed in the Kii and Bungo Channels, at Amami, Okunawa and Akum—all three in the Lu Chiu Islands archipelago ; mine fields in the channel between Sakhalin and Yezo and between Yezo and Nippon ; fortification area on the Bonin Islands, and of course Port Arthur and Kiaochow.

The naval bases are those at which the four admiralties have their headquarters : the dock-yards of Yokosuka, Kure, Sasebo and Marizuru. These all possess dry-docks for accommodating was ships. In addition to these Port Arthur possesses a dry-dock but lacks necessary equipment for building war-ships. Two other dock-yards which have built war-ships are the Mitsubishi Ship Yards at Kobe, and also the Osaka Iron Works. In addition to these there are about eight other leading commercial dock-yards.

Tsuruga is a connecting port with Siberia, reconstructed in 1913 at an outlay of Y.800,000.

section of this cable from Tsushima to Fusan was acquired. About this time the work of laying an additional cable between Japan proper and Formosa was completed.

During the Russo-Japanese war Japan laid a cable between Sasebo and Dairen (South Manchuria) and next from Dairen to Chefoo (northern province of Shantung, China). Other cables between Nagasaki and Shanghai and connecting Japan with Siberia are also projected.

Summary of Japan's International Cable Stations

Nagasaki to Shanghai
,, ,, Vladivostok
,, ,, Fusan, via Tsushima
Sasebo ,, Dairen, to Chefu.

IV. China

A. PORTS AND NAVAL BASES

There are forty-eight main treaty ports known as Customs stations in all the provinces in China. Naval docks are located in the Chihli, Shantung and Fukien provinces. Both Nimrod Sound and Santuao are candidates for the chief Chinese naval base.

Naval school, recently reorganized on the British system, are located at Chefu, Nanking, Foochow and Canton.

B. RADIO STATIONS

(1) There are wireless installations at Dairen (Dalny), Hongkong, Peking (Chinese government, American legation, and Italian legation), Port Arthur, Shanghai (Chinese government), Tsingtao, Weihaiwei, Woosung.

(2) *Wireless Telephone.*—On August 24, 1918, a contract was concluded between the Marconi Company and the Chinese government for the supply of two hundred wireless telephone instalments each having a range of forty miles.

B. RADIO STATIONS

Radio Shore Stations	Vibration Metre			Electric Power K. W.		Distance of transmission (naut. mile) Day time	Night time
Funabashi (of the Imperial Navy, for Communication with Hawaii, the largest in the country) ..							
Ochiishi (Hokkaido)	300	600	1,800				
Choshi (Shimosa)	,,	,,	,,	7	(Quenched spark)	600	1,800
Shimizaki (Kii)	,,	,,	,,	30	,,	1,500	3,000
Tsunoshima (Nagato)	,,	,,	,,	3	,,	400	1,100
Osezaki (Hizen)	,,	,,	,,	4	(Ordinary spark)	400	1,100
Shimotsui (Inland Sea)	,,	,,	,,	30	(Quenched spark)	1,500	3,000
Rasa Island (Loochoo)	,,	,,	,,	4	,,	300	1,000
Cape Fuki (Formosa)	,,	300	600	3	,,	450	1,300
Dairen (Kwantung)	,,	,,	,,	4	(Ordinary spark)	450	1,200
				7	,,	500	1,300

Japan is a member of the international wireless union, and regulates the exchange of wireless between these ten coast stations and foreign steamers or between Japanese steamers and the coast stations in foreign countries under rules drawn up based on the principles laid down at the international radio-telegraph convention of Berlin, which regulations were put into effect July, 1919.

C. CABLE COMMUNICATIONS

By agreement made in 1870, Japan conceded to the Great Northern Telegraph Company of Denmark the exclusive right of landing on Japanese territory cables for international service.

Cables were laid between Nagasaki and Shanghai, Nagasaki and Vladivostok, and Nagasaki and Fusan. The cable between Nagasaki and Fusan (leading Korean port) via Tsushima (situated in the Straits between Japan and Korea) was laid in 1882 under charter foe thirty years. Japan purchased the first section of this Nagasaki-Fusan cable as far as Tsushima in 1891. After the annexation of Korea, in October, 1910, to be more exact, the second

C. CABLE COMMUNICATIONS

Telegraph connections have been made with the four cable companies operating in China ; with Russia and Japan in respect to the Manchurian telegraph system ; with Japan regarding the cables between Dairen and Chefoo, and between Shanghai and Nagasaki ; with Germany (now with Japan) in respect to the German cables connecting Shanghai, Tsingtau, Chefoo ; with India and France in respect to the communications and the Burmese anñ Indo-Chinese frontiers.

The four cable companies operating in China are—

(1) The Great Northern Telegraph Company Ltd. of Denmark

(2) The Eastern Extension, Australasia and China Telegraph Company, Ltd. British)

(3) The Commercial Pacific Cable Company (American)

(4) The Deutsch-Niederlandische Telegraphen Gesellschaft (German-Dutch).

Main cable offices are at Suikai, Tunghing, Hokow, Cheunnankwan, Manyün, Maimatchen, Tarcheng, Helampo, Hunchun, Shanghai, Chefoo, Tsingtao, Foochow, Amoy and Hongkong.

Vacuum Drying in Modern Industries

By James S. C. Chen, Research Chemist and J. P. Devine Co., Research Laboratory

(Presented at the Seventh National Exposition of Chemical Industries, Sept. 14, 1921, New York City)

THE recent war has exerted a profound influence on the industries of America; among these industries, none perhaps has received a greater impetus than that which deals with the manufacture and refining of organic materials. As the quality of organic products depends in a great measure on the apparatus employed, it is essential that the manufacturer possesses a thorough knowledge of the methods of production and refining, in order that he can supply a superior product to the world market.

James S. C. Chen, B.S.

Vacuum drying, which was used only in limited fields in the past, has in recent years attained a position of such importance in the chemical and allied industries that it is worth while to make a thorough and comprehensive study of the subject. It is the purpose of this article, first, to give an outline of the fundamental principles and advantages of vacuum drying, then to discuss a few types of vacuum drying apparatus, and finally to set forth the result of an investigation as to what extent vacuum drying has been applied to the chemical and allied industries up to the present time, and how it may be advantageously used in other industries which hitherto have never applied vacuum drying in their processes.

(2) That additional heat is required for the molecules to overcome inter-molecular attraction between the moisture and the material.

(3) And, finally, still additional heat is necessary for the molecules to overcome atmospheric pressure.

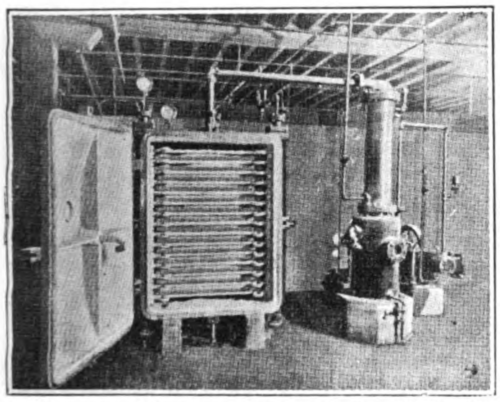
Frequently the heat that is required for the molecules of the moisture to overcome atmospheric pressure is sufficient to cause decomposition of the material. This condition necessitates the the use of vacuum drying. Furthermore, it is a well-known fact that the last trace of moisture is the most difficult to remove from any material; take starch for example:

100 Grams of Dry Starch

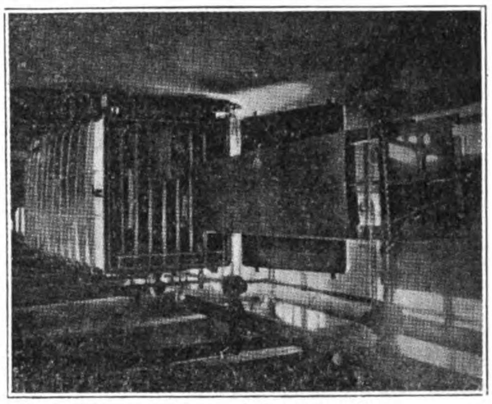
Per cent. of Water	Heat of Imbibition in Calories
.23	28.11
2.39	22.60
6.27	15.17
11.65	8.43
15.68	5.21
19.52	2.91

As a large quantity of heat is produced by a small initial quantity of water, according to the principle of the heat of imbibition, it would require the same quantity of heat to remove the last trace of moisture from the starch. This accounts for the difficulty met in the removal of moisture from organic materials. Vacuum drying is based on the elimination or reducing of the pressure on the surface of the material, and thereby accelerates the rate of evaporation.

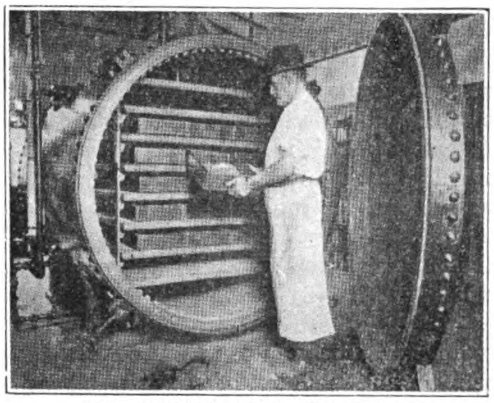
But, if vaccum drying were used only for the aforesaid purposes, its part in the industries would be a limited one indeed. At present



Vacuum Chamber Dryer and Auxiliaries, Figure 1



Vacuum Vertical Chamber Dryer, Figure 2



Vacuum Safety Chamber Dryer, Figure 3

I.

Drying, as it is ordinarily understood, means simply a process of removing moisture from a solid material, but applied to vacuum drying apparatus, it signifies a process of removing moisture or other volatile liquids from a material which may be in the liquid or solid state.

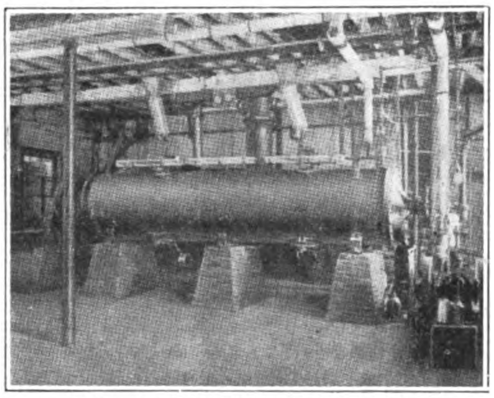
The process of removing moisture from a material depends on supplying enough kinetic energy to the molecules of the moisture by heating. The heat is used for three distinct purposes:

(1) That a definite amount of heat is required to transform the moisture from the liquid to the gaseous phase.

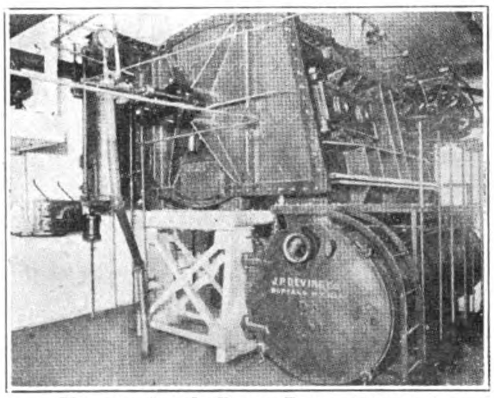
vacuum drying is extensively used in the chemical and allied industries not only because its use is in many instances imperative, but because the process is efficient, economical and insures superior and uniform quality of the finished product.

In the drying of organic substances, oxidation frequently takes place on the surface, which either changes the character of the material entirely, or gives an inferior product by altering the physical appearance.

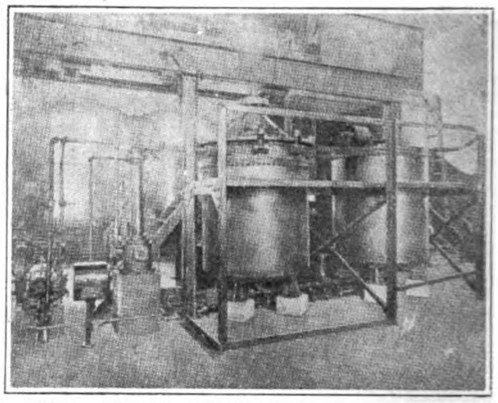
The writer recently demonstrated that the so-called "white sugar" which is marketed in the Far East, is greatly improved by being dried in vacuum, as the major portion of the sugar sold in the Far East is straw colored, which is evidently due to surface



Vaccum Rotary Dryer, Figure 4



Vaccum Single Drum Dryer, Figure 5



Vaccum Impregnating Apparatus, Figure 6

oxidation, and which can be avoided in a proper vacuum drying apparatus.

When materials are not liable to oxidation, their character may be altered, either by overheating, or by long contact with a constant heating surface, as in the case of many drugs and albuminous substances. In the vacuum drying process not only can the heat be controlled to a fraction of a degree, but the contact of the material with the heating surface can be avoided, and when it is necessary for the material to come in contact with the heating surface it can be controlled to a fraction of a minute, thereby preventing the material from deteriorating.

Fire risk attends the drying process in plants of organix industries; this is especially true in the case of smokeless powder and other high explosives. Constant danger demands constant supervision along with enormous cost of labor and frequent damage both to life and property. In the vacuum drying process this danger is minimized, not only because there is no direct heating medium, but the drying can be accomplished at the lowest temperature in the shortest time.

The fact that vacuum drying is independent of climatic conditions presents another distinct advantage. Any experiment or process once determined in vacuum can be accurately repeated. Would it not be a great advance in chemical science and industries, if the boiling point of all organic liquids were determined in a definitely reduced pressure ?

Under certain circumstances vacuum drying is by far the most economical of all drying processes, in that it reduces the drying period and consequently the cost of labor to a minimum. The transmission of heat is exceedingly efficient, due in part to the high vapor pressure of the moisture and in part to the great temperature difference between the material and the heating medium, which in turn gives a high co-efficient of heat transfer. Moreover, exhaust steam or hot water may be utilized to advantage as a heating medium, because drying can be conducted at low temperatures.

Vacuum drying equipment occupies but small floor space, and requires comparatively low cost for its operation. Therefore, plants where vacuum drying has never been used usually can install a vacuum drying unit without fundamental modification of their arrangement.

In the drug and dye industries, valuable solvents are frequently used; these solvents can be completely recovered in the vacuum drying apparatus, which in this instance serves a double purpose.

In other industries, such as rubber, the quantity of solvents used is so great that in order to insure safety and economy the solvents should be completely recovered.

Vacuum drying reduces the cost of transportation; in the past many food products, such as fruits, vegetables and dairy products, could not be advantageously dried without causing damage to their essential character and freshness. Hence, complicated and costly equipment was required for their transportation, which is made unnecessary by the vacuum drying process. When a certain percentage of moisture is desired in the material, its uniform distribution can be accomplished in the simplest manner in the vacuum apparatus.

The world demands a product of superior quality. No industry can long prosper or even survive if it ignores this fundamental point.

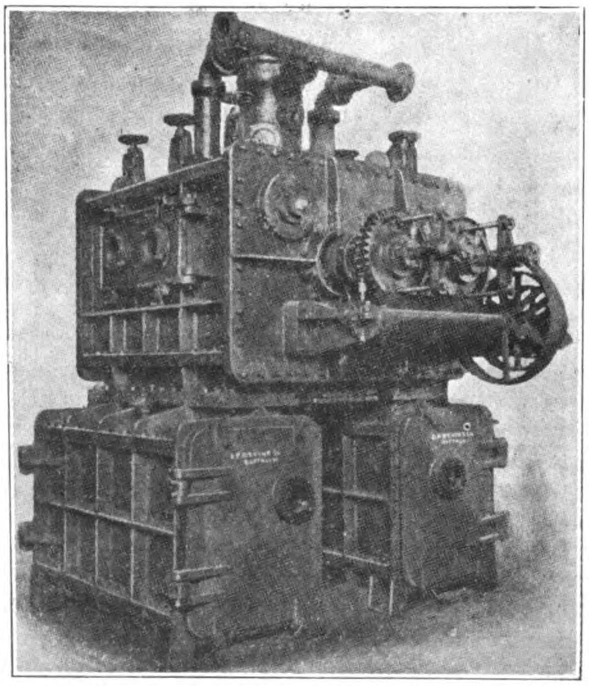
Not very long ago the writer personally worked on two entirely isolated drying problems, i.e., whole milk and chrome yellow. The milk that was dried to powdered form by the hot air method was only partly soluble in water at 70° C., while the same milk that was dried in vacuum was entirely soluble at the same temperature, and free from any randicity. But, milk dried by air under atmospheric conditions is noticeably rancid, evidently caused by the oxidation or overheating of the butter fats contained in the milk.

If it is possible to put color in words, this may be said with regard to chrome yellow, that the color of this dye is brighter when it is dried in vacuum than when it is dried in any other way. Further, it is possible by means of drying chrome yellow in vacuum to continually produce the same shade of finished product.

It is the general impression that the initial cost of vacuum drying equipment is too great to recommend it for general use. But, the economy of fuel, time, labor, coupled with the sturdy construction of vacuum drying apparatus and superior product make the use of vacuum drying not only desirable, but necessary, for it is certain that the future world market will be dominated not by the largest quantity but by the best quality of product. While the vacuum process may not be applicable to all drying problems, it certainly merits in each case careful investigation.

II.

Although it has been known for hundreds of years that under constant temperature the rate of evaporation increases as the atmospheric pressure decreases, vacuum drying did not find commercial use until Passburg invented vacuum drying apparatus. The Passburg patents were acquired and introduced into the United States by Mr. Joseph P. Devine of Buffalo, twenty years ago, and it is interesting to notice that by engineering genius and



Vaccum Double Drum Dryer, Figure 7

constant improvement the acquirer excels the inventor in more than one respect in the construction and application of vacuum drying apparatus.

There are as many types of vacuum dryers as there are drying problems ; for the present, four of the most general types of vacuum drying apparatus will be discussed, i.e., the chamber dryer, the rotary dryer, the drum dryer and the vacuum impregnator.

Chamber dryers are of two general types, i.e., the rectangular and the cylindrical. The outer casing of the former is made of cast iron, while that of the latter is made of sheet steel. As the nature of the materials may require, the heating shelves are arranged either horizontally or vertically.

Figure 1 shows a vacuum chamber dryer ; it consists of a heavily ribbed cast iron box in one or more sections ; the doors are also made of cast iron, and attached to the body by double swing hinges. The dryer is made air tight by fitting a rubber ring into the groove on the inside flange, and observation glasses are fitted on the door for inspection and control during the time of drying. heating shelves are made of two rolled steel plates, welded at the edges and separated by spaces flush riveted at regular intervals. The heating shelves can withstand a test pressure of 100 pounds ; they are very carefully made—the plates used for the making of heating shelves are hydraulically straightened, all holes are drilled and countersunk, and manufactured on specially constructed apparatus to insure perfect evenness and rigidity. Each heating shelf has its own independent steam feed and exhaust connections, giving complete drainage and allowing uniform heating. The arrangement of the distance between the heating shelves is a problem in itself, and is determined by the nature of the material to be dried. The principal points to be considered are the tendency of the material to effervesce during the drying process, the sensitiveness of the material to heat, and the height of the bubbles coming from the material caused by local conditions, that is, the temperature of the heating medium and the vacuum.

The capacity of the vacuum chamber dryer is based on the number of square feet of heating surface, which varies from a few square feet to several thousand square feet. The quantity of the vapor given off in a specified time must be taken into consideration in determining the capacity of the vacuum pump and that of the condenser. In order to secure the greatest efficiency of drying the capacity of both the vacuum pump and the condenser should be based on the peak of the load, for it must be remembered from the consideration of the heat of imbibition that other conditions being the same, the rate of evaporation will be the highest at the beginning of the drying, which steadily decreases until the last trace of the moisture is expelled. Should the capacity of the pump or condenser fall below the peak, not only would it be impossible to maintain the vacuum, but chemical reaction might take place between the vapor and the material on account of the rising temperature of the latter.

It is therefore of extreme importance that the capacity of the auxiliaries be calculated to fit the capacity of the vacuum chamber dryer, and what is true of the vaccum chamber dryer may be said for all drying apparatus.

The vacuum chamber dryer is used for drying all materials which can be handled on trays, and which do not need stirring during the process. The trays are made of steel, enamel or other materials, as the nature of the material may demand. The bottom of the tray must be as smooth as possible, so that uniform transmission of heat may be secured. In operation, the heating shelves are first of all heated with hot water or steam, then the vacuum chamber dryer is charged, and finally the vacuum pump is started. The loss of time for loading and unloading a vacuum chamber dryer was heretofore considered an objection, but this is no longer a serious matter on account of the improvement in auxiliaries.

The vacuum chamber dryer with vertical heating shelves, as per figure No. 2, is especially adapted to the drying of fabrics, lumber and felt, and all materials that must be placed in a vertical position during drying.

Figure 3 shows a safety vacuum dryer for the drying of high explosives ; this dryer is equipped with safety valves with ground joints ; the door and rear of the dryer are held to the body of the apparatus by a number of spring devices so that in case of internal explosion the pressure must build up to equal the pressure of the atmosphere, which releases the safety openings and doors, so that the damage is reduced to a minimum. Thus vacuum drying in the case of high explosives is not only the most economical process but the safest.

The rotary vacuum dryer is especially adapted to materials that can be stirred or agitated during drying. This type of apparatus consists of a steam jacketed outer cylinder with an interior rotating heating tube to which is attached adjustable stirring blades of very rigid construction. The materials to be dried are kept in constant motion, bringing new particles of the material in contact with the heating surface, so that the drying time is greatly reduced, and a very much larger quantity can be handled per charge.

When drying a material which has a tendency to coat the heating surface, the apparatus is installed with adjustable scrapers to prevent the coating of the heating surface.

The rotary vacuum dryer can be made continuous in operation, and is by far the most economical type of apparatus for handling granular or powdered materials.

For substances that can readily form a film the vacuum drum dryers are specially useful. There are two general types of vacuum drum dryers, namely, the double and the single.

The single drum dryer consists of an outer cast iron casing, inside of which rotates a hollow drum made of cast iron, bronze, gun metal or other materials. The drum is well balanced, polished and heated internally with hot water or steam, and where high temperatures are necessary, hot oil and even internal combustion may be employed.

The material to be dried is placed on the single drum in various ways ; and the simplest method is to dip the drum into the material which is automatically regulated and kept at a constant level. The ends of the drum are protected by adjustable shield rings, thereby preventing the material from solidifying on them. When working with a material that is delicate and sensitive to heat, the film is placed on the drum by a small feeding-roller. The material is fed from a cooled liquor trough to the feed roller and thence to the large drum. In this way the material does not come in contact with any heating surface before it reaches the drum.

The vacuum double drum dryer is constructed on similar lines to the single drum dryer, and is of more recent development. It consists of two drums rotating in opposite directions, a knife device for the removal of the dried material, and an agitator to prevent the material from solidifying.

The vacuum double drum dryer has great advantages over the single drum dryer, as a larger quantity of material can be handled in a smaller apparatus; semi-liquid as well as liquid materials can be dried in a double drum dryer, and the difficulty of effervescing experienced with any type of single drum dryer, can be overcome in a double drum dryer.

Like the rotary vacuum dryer, both types of vacuum drum dryers are made continuous in operation.

The study of vacuum impregnation is at once fascinating and instructive. The apparatus consists of a liquor tank and a vacuum drying and impregnating chamber, which is steam jacketed. The materials to be impregnated are put in the latter while the former serves as a storage for the compound. The two are connected by steam jacketed pipes so as to prevent the compound from solidifying.

The materials to be impregnated are subjected to drying in the vacuum chamber as in the case of chamber drying, where the air and moisture in the material are rapidly removed. The liquified compound is now drawn into the chamber. On account of the absence of air and moisture the compound immediately penetrates the innermost recesses of the material. To render the pene-

tration of the compound more rapid and thorough, the action of the vacuum pump is reversed, changing it into a compressor, and the combined action of vacuum and pressure results in a uniformly impregnated product in a short time.

Mindful of the fact that it is not possible to do justice to all types of vacuum drying apparatus, it is opportune to investigate just to what extent the foregoing mentioned apparatus have been applied to modern industries.

III

Extensive investigation with regard to the application of vacuum drying to modern industries has disclosed the fact that during the last twenty years, thousands of substances, representing hundreds of industries, hav been successfully dried by the four types of apparatus just discussed. To enumerate them would serve no useful purpose, for in many cases the requirements of the different industries concerning the quality of their products are identical. It is the object, therefore, of this article to give just a few of the leading industries along with some typical substances, in which the use of vacuum drying has proven to be a distinct advance.

I. Food Industries.—The fundamental requirements with regard to drying in food industries is not only the reduction of the bulk of the products whereby the same can be easily transported from place to place, but the conservation of the freshness and the essential qualities of the food articles, such as odor and taste. These conditions can only be successfully met by the vacuum drying apparatus, and the drying of such articles as meats, meat extracts, fish, eggs, milk, vegetables, vegetable extracts, fruits, nuts, cocoa, tea, coffee, chocolates, biscuits, corn, cereals, starches and yeast will speak for themselves.

Fruits and Vegetables.—Weight of dried fruits and vegetables produced from 100-lbs. of green product: Apples, 12.5-lbs.; cherries, 6.6-lbs.; pineapples, 10-lbs.; plums, 33-lbs.; cranberries, 10-lbs.; currents, 14.3-lbs.; huckleberries, 14.3-lbs.; lemons, 14.3-lbs.; oranges, 16-lbs.; beans, 7.1-lbs.; beets, 7.-lbs.; cabbage, 5.5-lbs.; carrots, 7.6-lbs.; cauliflower, 4-lbs.; celery, 5-lbs.; corn (green), 8.3-lbs.; egg plant, 6.3-lbs; leek, 10-lbs.; lima beans, 12.5-lbs.; okra, 12.5-lbs; raisins, 25-lbs; raspberries, 14.3-lbs.; rhubarb, 5-lbs.; peaches, 10-lbs.; strawberries, 5.5-lbs.; parsley, 9-lbs.; parsnip, 20-lbs.; peas, 12-lbs.: potatoes (white), 17-lbs.; potatoes (sweet), 12.5-lbs.; pumpkins, 8.3-lbs.; rhubarb, 5-lbs.; spinach, 7.1-lbs.; tomatoes, 5-lbs; turnips, 6-lbs.

II. Chemical Industries.—The world demands purity of chemicals. This requirement must be met during the process of refining, when the last trace of moisture is to be removed and where contamination, due to the presence of air, metallic contact and overheating are to be avoided. Under these industries we find the successful drying of acetates, organic acids, inorganic salts, aniline salts, beta napthol, alkaline solutions, sulphur lime and white lead.

I. Drug Industries.—There is an upper limit of temperature beyond which many medicinal materials cannot be dried without causing serious decomposition. Further, there is an upper limit of temperature beyond which the intrinsic value of medicinal materials gradually decreases, although their physical properties remain unchanged. Drying in the vacuum the lowest temperature can be employed for the elimination of the included moisture, giving the best quality in such products as blood serums, pepsin, hexamethylenetramine, aspirin and phenacetine.

IV. Dye and Rubber Industries.—In the dye and rubber industries large quantities of valuable solvents are used. With the vacuum apparatus these can be completely recovered. For this purpose vacuum drying apparatus are successfully employed in drying aniline oils, resorcin, organic dyes, dyestuffs, color wood extracts, sulphur black, chrome yellow, rubber, rubber substitutes and reclaimed rubber.

V. Wood and Allied Industries.—The rapid and uniform drying of wood products, sometimes by the use of exhaust steam, makes vacuum drying the most desirable and economical. Uniform impregnation of wood products in the vacuum constitutes another feature that cannot be equalled by other kinds of apparatus. The following have been successfully dried and impregnated:—Timbers, wood products, celluloid, paper, electric apparatus, insulating materials, accumulator plates, magnetic coils and cables.

VI. Leather and Felt Industries.—The drying of leather and finished products requires the complete removal of the moisture without extracting the grease to the surface. This result can be secured quickly in the vacuum drying apparatus, as is evidenced by the successful drying of hides, pig skins, leather, shoes, felt, fur and hats.

VII. Explosive Industries.—The constant danger that attends the drying of high explosives, requires that it be done in the shortest time and at the lowest temperature; and in this connection it is found that the vacuum drying apparatus are the safest and most successful in such plants as smokeless powder, trinitrotoluene, trinitroaniline and ammonium nitrate.

To sum up: (1) That in this article the fundamental principles and advantages of vacuum drying have been clearly outlined, and these advantages would warrant a more extensive application of the vacuum process to drying problems; (2) that a brief discussion of the four more general types of vacuum drying apparatus has been made, in which their unique advantages are pointed out; (3) that the result of an investigation as to the part of vacuum drying in modern industries has been briefly discussed.

It is certain that the discussion of vacuum drying in this article does not aim to be exhaustive; on the contrary, only the first principles are discussed with a view to emphasize the supreme importance of research in modern industries. We need only remind ourselves that we are in an era of great manufacturing activity and keen competition, and that no modern industry can long prosper or even survive without giving constant attention to the improvement of its method of production and refining, and to the quality of its products.

Production and Use of Fluorspar in Japan

Fluorspar is produced in small quantities at Ishikure, in Ise province, and also at Hotatsusan, in Noto province. The domestic product is of such poor quality, however, that the greater part of the demand is supplied from foreign sources, principally Korea, Manchuria and South China. So far as can be ascertained, none is imported from the United States.

The grade used varies from CaF_2 of 50 per cent. quality, secured from Shinmaku, in Korea, to CaF_2 of 80 to 85 per cent., secured from South China. That which grades 80 per cent. or more is generally required in the local steel industry, although the Mitsubishi Co. uses a 50 per cent. grade at the Kenjiho Works. Fluorspar of 65 to 70 per cent. is utilized in the manufacture of glass and enamel ware. A certain amount is utilized at the Kamioka mine of Mitsui & Co. and also at the Osaka Electric Refinery of the Mitsubishi Co. Approximate prices c. i. f. Japanese ports are as follows: Korean, 50 per cent. quality, 12.50 yen per ton; Manchurian and Korean, 65 per cent., 25 yen per ton; South China, 80 to 85 per cent., 50 yen per ton.

The total amount of fluorspar used in the Japanese steel industry during 1920 was 230 metric tons.

Because of the small amount imported, flourspar is not listed separately in the Japanese trade statistics, not has it been possible to secure this information from other sources. It is probable that the total importation for all use will not exceed 300 tons, including the amounts received from Korea. Due to the depression in the steel industry and the competition of near-by producers, who are more favorably situated in regard to transportation costs, prospects are not very encouraging for the importation of the American product.

A Review of Japanese Banking

1. Development of the National Banks

BANKING in the modern sense of the word began in Japan in 1871, when the late Prince Ito returning from the United States where he had been studying business methods, proposed that the Japanese government establish a banking system like that of the national banks of the United States. His proposal was acted upon, and in 1872 the "Regulations Controlling National Banks" were promulgated. But before this first step of the government to establish banking institutions under legal restraints, there were several industries already established which bore some of the functions of the modern bank actively engaged in exchange transactions in Japan. The new regulations put an end to these institutions known as "Tsusho Kaisha" or "Kawase Kaisha" (commercial companies, or money order companies), and there was need of doing away with them so serious were their abuses of the trust reposed in them. The new regulations stated that they were promulgated "for the convenience of the people by the establishment of banks."

Banks established under these new regulations were granted the right of issue. This measure was expected to smooth out existing irregularities in the circulation of money which had been so disastrous under the old system. Actually this result was not achieved, and many abuses of the issue right became apparent, largely because of the incompleteness of the system. Only five banks were established under this law, and they were named in order of establishment the "First Bank" to the "Fifth Bank."

The regulations provided that at least 40 per cent. of the capital of the banks established under its provisions should be held in gold. This reserve was to be the guarantee of repayment of the notes issued. Unfortunately the government was in desperate financial straits, and paper money was issued in reckless fashion, and the difference in value between paper and specie soon became so great that there were "runs" on every bank practically all the time, and things finally got into such a state that the banks were unable to function at all. They were utterly without specie, there was only irredeemable paper money in circulation, and no one had the least confidence in "these banks, or the financial policy of the government behind them."

Things finally came to such a pass that in 1876 the banking regulations were reformed. This time capital was to be 80 per cent. at least, invested in the public loans, and the bonds were to be deposited with the government, which issued against them paper money of equal face value, which the banks put into circulation as loans to business enterprises. The remaining 20 per cent. of bank capital was to be held in gold in the bank's vaults, and not put into circulation. Notes could be redeemed in new notes, there was no obligation of specie redemption.

The immediate result of this change in regulations was to popularize the establishment of national banks. The restrictions on issue were practically all removed, and the result was to increase the amount of paper money in circulation till it became a veritable flood. There were too many banks all issuing notes, and it did not take the government long to see that the condition of affairs was worse than it had ever been before. So in December 1877 the regulations again changed.

The new regulations provided that the amount of the capital of a bank, and the amount of notes is might issue, must be first approved and licensed by the ministry of finance. But this proved an inefficient measure, and it was necessary to change the laws again the following year, 1878. This time the total amount of notes that all the banks might issue was limited to Y.34,420,000 (more or less by a small amount). At that time there were exactly 153 national banks in operation, and their total note issue was about Y.34,000,000. The law provided that no new banks could be established under the national banking laws, and this closed the period of the development of national banks, which had lasted from 1872-1879.

2. Ordinary Banks Spring Up

After 1879 ordinary banks, similar to present day institutions began to make their appearance in the financial organization. Even before 1879 there were a few important companies carrying on such usual banking operations as receiving deposits, making loans and engaging in exchange transactions, notably the Mitsui Gumi Ginko, (Mitsui Association Bank). But under the cloak of the law there was still no place for the activities of these ordinary banks. The first of these "Ordinary Banks" (Futsu-Ginko) was licensed in 1877 when the regulations were changed, by the Mitsui Gumi, under the name of the Mitsui Ginko (Mitsui Bank). Very few other similar banks were established, the National Bank was too popular with investors to attract much notice at that time. In 1879 when the national banks were at the zenith of their prosperity and popularity, the ordinary banks slowly began to appear. In 1880, thirty-nine ordinary banks were established, and in this year the Yokohama Specie Bank was organized.

The Yokohama Specie Bank was organized to assist in effecting some harmonization between foreign and domestic exchange. Foreign trade had been growing year after year, but the awful condition of the national currency was disastrously affecting its steady and healthy progress. In December 1879 the Specie Bank was licensed to begin business with a capital of Y.3,000,000. One million yen of this was deposited with the government in gold, and of the balance of Y.2,000,000, Y.400,000 was deposited in silver, and the rest of the capital Y.1,600,000 was paid up in paper. One of the principal objects of this bank was to keep silver exchange from the violent fluctuations which were disorganizing trade. It was confidently expected that his bank would succeed in bringing about a decrease in the exchange value of silver.

3. Establishment of the Nihon Ginko (Bank of Japan)

During the time between the first authorization of the national banks and the establishment of the first ordinary banks there was a great development of banks in Japan. But banks were really a new kind of business in Japan, and the system authorized by the government was not particularly suitable to Japanese peculiar conditions. The system adopted was only a copy of those abroad, and consequently there were many places where it did not fit into Japanese conditions at all. This was the reason that the issue of paper money was so recklessly increased, and it was only as the great gulf between specie and paper opened wider every day with its detrimental effect on the national commerce that it became evident that something must be done before the nation went to stark ruin. Prices rose, and rates of interest advanced to such a figure that the evils of the time were almost more than the nation could bear.

The government sought about for any suitable means of relieving the situation, and it was the late Prince Ito again who resolved that the only way out of the mess was a complete stoppage of issue of inconvertible notes, and the complete redemption of those then in circulation. Marquis Matsukata who became finance

minister at that time was strongly in favor of this plan of Prince Ito's, and furthered it at every opportunity. In order to assist the government in obtaining its object, it seemed to the financiers of the time that some strong central organ of finance was absolutely essential to the success of the new scheme.

A proposal was accordingly made that a central financial organ be created to (1) smooth out the circulation of money, (2) to supply capital to the national banks, and private companies and (3) to bring about a decrease in the charges made for interest. The plan provided that when the bank was established and in operation it should assume the functions of the department of finance.

The business of discounting foreign trade bills was to be centred in this new bank. On June 27, 1882, the government promulgated the act providing for the establishment of the Nihon Ginko, and at the same time the promoters were appointed. The capital of the bank was fixed at Y.10,000,000, on half of which was to be taken up by the government, the other half open to public subscription. The shares were soon disposed of, and on October 10, 1882, the bank was opened for business.

At the beginning of business the difference between the value of papers and specie was so great that the government did not permit the new bank the right of issue. But the object of the bank being to effect a return to hard money payments the issue of inconvertible notes was gradually restricted, and the regulations governing the national banks reformed, so that eventually the issue of covertible notes was placed in the hands of the Nihon Ginko. Thus in actual use as well as in name, the Nihon Ginko became the centre of the financial world of Japan. The previously existing banks losing their rights of issue were reorganized as ordinary banks and the Nihon Ginko as the real central organ of finance soon began to supply all the funds needed in business.

In 1878 the national banks were permitted to carry on the business of savings banks, but the first known independent savings bank was not organized until 1880.

The Special Banks

In this manner the banking system of Japan was gradually developed, tried out, and adjusted to purely Japanese conditions. The principal purposes of the banks were to supply short term loans to commercial and business houses. Agriculturists and manufacturers and such other persons as required long-term loans found it very difficult to get advances needed for their enterprises. The government took cognizance of this lack in the existing system and in 1896 the Nihon Kangyo Ginko (The Hypothec Bank of Japan) was established by special law, as a semi-official bank, its purpose being to encourage the operations of industry. Co-operating with the Kangyo Ginko, in each prefecture a Noko Ginko (banks of agriculture and industry) was organized. And in this manner the Kangyo Ginko became the centre of credit for the whole nation's industry. It supplies money on long terms to industrial concerns, while the local banks of agriculture and industry lend money to develop special industries in their own localities.

In the Hokkaido industrial conditions are somewhat different from those in Japan, and it was found necessary to develop a special organ of finance for business there. So in 1899 the Hokkaido Takushoku Ginko was organized by law, its object being to encourage colonization in the Hokkaido by offering a means of obtaining funds to develop industries there.

In this manner organs of finance to supply capital to business on the security of immovable properties were developed, and money could be obtained for long terms from them at comparatively low interest. These banks are called the "Fudosan" (immovable property) Ginko, and their special function is to make needed advances of money on immovable property in order to advance the development of agricultural and manufacturing industries.

Now that ordinary commercial transactions and long-term loans were taken care of by special banks organized under official or semi-official auspices, it became apparent that it was also necessary to have some special banks to advance funds on the security of movable properties, and on bonds, and stocks. So in 1902, the Nihon Kogyo Ginko, (Japan Industrial Bank) was established by official order. Its object was to advance money on the security of valuable securities, especially on bonds and stocks. It also specialized in loans for factory building, and it was active in importing foreign capital for use in Japanese industry. It is also the first Japanese bank to undertake a trust business.

After the annexation of Formosa it was soon discovered that a special bank was needed there to handle the ever growing business transactions with the home country. The Bank of Taiwah (Formosan Bank), was accordingly established in 1900. It acts as a bank of issue in Formosa, and handles all the funds of the government general of Taiwan, lends money to individuals and companies, and in general acts as the central financial organ of Formosa. It also assists merchants to extend their operations towards the South, into the South Seas, as the Japanese call the lands lying south of Formosa.

In Korea a bank similar to the Bank of Taiwan was much needed, and in 1909, the government legally organized the Bank of Chosen, as a successor of the Dai Ichi Ginko. This bank is also a bank of issue, and it is the central financial organ of Korea. It keeps the funds of the national treasury, and the government general on deposit, and also carries on private business. Its notes have no connection with the notes of the Bank of Japan.

In the manner described the Japanese banking system has been developed during the past fifty years. Every year its operations become more complete, and its nearness to the heart of the nation's problems is generally acknowledged. Perhaps the system is not free from points of criticism, but the faults are details, and the advantages to the nations's industry are manifest in a thousand telling ways.

Trust Companies in Japan

TOKYO, October 9.—The business of the Trust Company in Japan is not quite so new as might be thought from the seeming absence of such organizations in the economic world. Before the war there were over five hundred companies registered which had the word "Shintaku" meaning "trust or confidence" in their company names, or which stated in their "Objects for Incorporation," that they undertook "trust business." All together, before the war, about Y.40,000,000 were invested in these 500 companies. In Tokyo alone there were 250 trust companies, capitalized at Y.25,000,000.

Nature of Early Companies

These early trust companies undertook the management of estates: the improvement and reclamation of land and buildings: adjustment and management of private property ; took charge of investments ; settled accounts for companies and private persons ; made loans on real property and buildings, or lent money on credit and also acted as loan brokers. On occasions they bought and sold land, and engaged in any kind of commission transactions in commercial goods. Most of them were, however, only a sort of building and loan association, which sold homes on the instalment plan. They also sold bonds and shares on the instalment plan. Many of them acted as trustees and custodians, and some of them were merely bill collectors.

In these many ways these "trust" companies suddenly sprang up all over the place before 1914, and they all seemed to be very active and prosperous. But looked at with a critical eye most of them were really only engaged in selling bonds and shares on monthly instalments, or acted as mutual credit associations. Many of them carried on very fraudulent business indeed, and money entrusted to them for any purpose was squandered recklessly in hopelessly incompetent industries.

There were, of course, everal real trust companies among all these concerns. These companies really acted as loan brokers. They borrowed money from many persons and lent to a favored few. It is very simple to issue loan certificates to many persons for money lent for a seeming purpose, but it is not easy to divide security up amongst the lenders. So loan certificates became popular with such companies, and they held the security for the loans themselves.

The trust companies were responsible for the securities, they approved them, and accepted them, as collateral for issuance of their own loan certificates. This was all very well when there really was care and attention shown to the class of security accepted, but more often than not, the security was valueless, and the borrower was a friend of the trust company. The holders of the loan certificates were calmly swindled out of their money.

Banks as Trust Companies

In 1906, a law was promulgated regulating the operations of companies issuing trust debentures against securities. But the operation of the law was confined to companies with more than Y.1,000,000 capital. Other trust companies with less than one million capital were prohibited from issuing these debentures, and were practically confined to carrying on a sort of banking business. As a matter of fact, before the war the only real trust companies in all Japan were a few of the great banks, the Nippon Kogyo Ginko, the Mitsui Ginko, the Yasuda Ginko, the Dai Hyaku Ginko and the Dai Sanju Shi Ginko. Other companies were only "trust companies" in name, and their business in amount, was more or less than nothing at all, and only a kind of "note-shaving."

War Brings Changes

After the great war, there were many great changes in the economic organization of Japan. Naturally, the trust companies were also affected. Many new industries sprang up in 1919, and they all required capital on long time terms. The banks previously had been able to meet all demands for industrial funds, but the demand after the war was so sudden and so great that the banks were unable to keep up with the demand for long-term loans and still keep mobile funds for commercial transactions. This brought the trust companies into the loan market as supplies of capital, on long-time terms, to budding and promising industrial ventures.

To meet the new demand many new trust companies were organized. The Nichi-Bei Shintaku K.K., the Nissho Shintaku K. K., the Kyosho Shintaku K. K., the Nichiro Shintaku K. K., and many others sprang up to meet the growing needs of the country for long-time loan funds.

The leader in the movement was the Bank of Taiwan, which for a time accepted "deposits on trust," for from three to five years at a higher rate of interest than the banks allowed on fixed deposits. But this was only an episode in the bank's career, and the new trust deposits were soon abandoned after a somewhat inglorious trial.

Among the many trust companies which were organized in the after-the-war boom, the Nichi-Shintaku may be taken as representative of them all. Both these companies are capitalized at Y.50,000,000 each, which is more than the total capitalization of the 50 trust companies organized before the war. From this one fact alone it can be seen what a decided advance has been made in the standing of the trust company's business during the past few years.

These new trust companies undertake all the usual business of trust companies in America and Great Britain, and add to their activities, the guaranteeing of company and personal loans. They also guarantee the rate of dividends on stocks of new companies, but this is also a part of the work of American trust companies. The two great trust companies, the Nichi-Bei Shintaku K. K., and the Kokusai Shintaku K. K., find that the greatest part of their activity is centred around the guaranteeing of loans.

Something Good

The present trust companies are beginning to fill a very definite need in the present economic organization of the country as suppliers of capital which the banks cannot lend for the long time the trust companies can consider. But in this function the trust companies really assist the banks, but even under the best of circumstances some collision of interests between the trust companies and the banks may be expected. They both solicit deposits of funds from the public. There is practically no difference between the deposits in the trust companies and the bank's fixed deposits, but it is easier for the trust companies to make long-term loans.

So, it happens that for some time past the trust companies have been more successful in getting long time deposits than the banks have been. Before the war there was not a single trust company with such an ability, but now the deposits of the Nichibei and Kokusai Shintaku Companies are very large. In order, therefore, to avoid a collision between the banks and the trust companies, the government should rewrite the laws under which trust companies operate.

New Plan Outlined

Deposits with trust companies partake of the nature of savings deposits. Banks should devote themselves exclusively to short-time current account deposits, and to discount, while trust companies should concern themselves only with long-term loans. Trust company deposits will then assume the character of real fixed deposits, and the deposits in the banks will be only temporary deposits. Banks should lend money for commercial transactions only, while the trust companies should confine their loans to industrial concerns which require long-time terms.

As things are managed in the banks to-day there will soon be a collision between them and the trust companies, so the division of the loan field should be made as soon as possible between their present conflicting interests. In this way the great banks will naturally be obliged to establish co-operating trust companies which will have the confidence of rich capitalists who will deposit their money with them for the development of the industrial organization of the country.

The trust company business in Japan is still only in its swaddling clothes and it remains to be seen what it can do if permitted to go on competing with the banks for long-time deposits. But it is necessary that the law be changed in order to avoid ruinous competition between the banks and the trust companies. The new law should provide for very complete investigation and inspection of the accounts of all trust companies, and their investments and all loans should be strictly controlled by the government.

If these things are provided for in the new law there is no doubt of the future of the trust companies. They will then become a most valuable accession to the economic world which requires a reliable organ through which funds for industrial use can be obtained on terms which banks, with their necessity of keeping their funds mobile, are unable to give without endangering the commercial interests of the nation.

The Thirteen Great Banks of Japan

THIRTEEN banks in Japan carry deposits of over Y.100,000,000 each. Eight of these are in Tokyo and five in Osaka, the former being the Mitsui Bank, Ltd., Dai Ichi Ginko, Ltd., Jugo Ginko, Ltd., Mitsubishi Ginko, Ltd., Kawasaki Ginko, Ltd., Yasuda Ginko, Ltd., Dai San Ginko, Ltd., and the Dai Hyaku Ginko, Ltd., while the Osaka banks are the Sumitomo Ginko, Ltd., 34th Bank, Ltd., Yamaguchi Ginko, Ltd., Omi Ginko, Ltd., and Kajima

Ginko, Ltd. Considering the great amount of their deposits these thirteen institutions may quite reasonably be called the "Great Banks" of Japan.

At the end of June, 1918, deposits in all the banks in Japan totaled Y.3,806,000,000, and by the end of June, 1919, this had increased to Y.5,744,000,000. This amount has not yet been exceeded, and it is doubtful if it will be exceeded in the near future if present unfavorable conditions in the business and industrial worlds continue.

The greater part of Japan's bank deposits is held by the banks forming the membership of the clearing house associations in the great commercial centres, as is clearly shown by the following figures :—

	Total Deposits Whole Country	Deposits in Clearing House Banks
	Yen	Yen
1918, June 30 ..	3,806,533,000	3,496,974,000
Dec. 31 ..	4,639,315,000	4,307,961,000
1919, June 30 ..	5,192,938,000	4,607,067,000
Dec. 31 ..	5,744,097,000	4,975,596,000
1920, June 30 ..	Unknown	4,866,251,000
Dec. 31 ..	Unknown	4,811,190,000
1921, June 30 ..	Unknown	5,101,000,000

(*Note.*—Some of the exchange banks have not reported their deposits of June 30, 1921, so the 1921 figure is an estimate.)

Clearing house associations exist in Tokyo, Osaka, Kobe, Kyoto, Yokohama Nagoya, Hiroshima, Shimonoseki, Moji, Kanazawa, Hakodate, Otaru, Sapporo and Fukuoka, seventeen cities in all, covering every important commercial district from north to south.

On December 31, 1918, about ninety-five per cent. of the bank deposits of the country were held in the clearing house banks, but on December 31, 1919, they held only eighty-seven per cent. By June 30, 1920, their deposits had increased by Y.111,000,000 ; the end of the year showed a decrease of half this amount, but again by June 30, 1921, an increase of Y.290,000,000 had been made in their deposits. These thirteen banks have weathered the panic of 1920 in a manner inspiring the ordinary bank depositor with confidence. As a natural result of this confidence in the clearing house banks their deposits are steadily increasing in the present trying times. The greater part of the deposits shown in the first table are held by the 13 great banks. On Jnne 30, 1919, they held Y.2,934,000,000, on December 31, 1919, Y.2,915,000,000, and on June 30, 1920, about Y.3,000,000,000, out of Y.4,866,251,000, representing the total deposits in all clearing house banks in all Japan. In other words sixty per cent. was held by the Great Thirteen, and they hold more than fifty per cent. of the deposits of the whole country. This is an extraordinary state of affairs.

At the end of June, 1921, the Mitsui Bank carried the largest deposits, and the Dai Hyaku Ginko the smallest of the eight of the Great Thirteen in Tokyo. In Osaka the Sumitomo Bank held the most and the Kajima Bank the least. In order of amounts of deposits held these thirteen institutions rank as follows :—

1. Mitsui Ginko, Ltd.
2. Dai Ichi Ginko, Ltd.(First Bank).
3. Jugo Ginko, Ltd. (Fifteenth Bank).
4. Sumitomo Ginko, Ltd.
5. Mitsubishi Ginko, Ltd.
6. The San Ju Shi Ginko, Ltd. (Thirty-Fourth Bank).
7. Yamaguchi Ginko, Ltd.
8. Kawasaki Ginko, Ltd.
9. Yasuda Ginko, Ltd.
10. Omi Ginko, Ltd.
11. Kajima Ginko, Ltd.
12. Dai San Ginko, Ltd. (Third Bank).
13. Dai Hyaku Ginko, Ltd. (Hundredth Bank).

Deposits in these thirteen banks in Tokyo and Osaka during 1920 and to the end of June, 1921, were as follows :

	June 30, 1920.	Dec. 31, 1920.	June 30. 1921.
Tokyo.	Yen	Yen	Yen
Mtsui Bank	412,188,000	424,702,000	413,194,000
Dai Ichi Ginko ..	380,134,000	377,363,000	390,356,000
Jugo Ginko	344,099,000	339,609,000	357,885,000
Mitsubishi Ginko ..	270,100,000	264,550,000	264,550,000
Kawasaki Ginko ..	161,442,000	165,876,000	173,469,000
Yasuda Ginko ..	128,877,000	150,174,000	150,228,000
Dai San Ginko ..	132,460,000	134,916,000	138,902,000
Dai Hyaku Ginko ..	122,919,000	106,274,000	110,740,000
Total	Y.1,952,215,000	Y.1,963,462,000	Y.1,999,324,000

(*Note.*—The Kawasaki Bank of Kobe, and the Jugo Ginko of Tokyo were amalgamated after July 1, 1920 ; the volume of deposits for June 30, 1920, is therefore their combined deposits on that date. The Mitsuibishi and Sumitomo Banks have not yet published their reports for the first half-year of 1921, so the deposits for December 31, 1920, are repeated in the 1921 column.)

	June 30, 1920.	Dec. 31, 1920.	June 30, 1921.
Osaka.	Yen	Yen	Yen
Sumitomo Ginko ..	359,764,000	315,441,000	315,441,000
Dai San Ju Shi Ginko	194,457,000	193,677,000	209,523,000
Yamaguchi Ginko ..	182,860,000	182,221,000	186,635,000
Omi Ginko	125,478,000	132,939,000	145,695,000
Kajima Ginko ..	119,451,000	127,644,000	140,523,000
Total ..	Y.981,830,000	Y.951,922,000	Y:995,867,000
Grand Total	Y.2,934,049,000	Y.2,915,384,000	Y.2,995,191,000

Before the war the Dai Hyaku Ginko, Ltd., occupied a position about midway on the list of the great banks, but it has now fallen to the last place on the list.

The greatest deposits in this list are held by the Mitsubishi Bank, Dai Ichi Ginko, Ltd., Jugo Ginko, Ltd., Sumitomo Ginko, Ltd., and Mitsubishi Ginko, Ltd. These are called the "Great Banks" of the first rank. The second rank is composed of the Dai San Ju Shi Ginko, Ltd., Yamaguchi Ginko, Ltd., Kawasaki Ginko, Ltd., Yasuda Ginko, Ltd., Omi Ginko, Ltd., Kajima Ginko, Ltd., Dai San Ginko Ltd., and Dai Hyaku Ginko, Ltd. The lowest deposits total of first rank institutions is that of the Mitsubishi Ginko, and in the second rank the Dai San Ju Shi Ginko comes first. Between the banks of the first and those of the second rank there is a difference in deposits of about Y.60,000,000, so the line may well be drawn where it is. Nevertheless the difference in deposits between the Sumitomo Ginko, the next to the last on the list of the first rank, and the Mitsubishi Ginko, the last on the first rank list, is over Y.50,000,000, so the Mitsubishi Ginko may be said to occupy a position midway between the great banks of the first rank and those of the second rank.

Many factors determine the amount of deposits which these banks carry. All are strongly established in the confidence of the public, and it appears that the amount of each bank's capital, its system of branch offices which tap the resource centres of the country, and the number of its correspondents all have a profound effect on the volume of its deposits. Nevertheless in the present condition of business, and even banking, no great extension of business may be hoped for by increasing capital, or extending branch offices and the number of correspondents of any of these banks. The figures given will show some slight hint of present banking conditions and their potentialities.

Perhaps the outstanding feature is the greater financial importance of Tokyo's banks as compared with those of Osaka. Undoubtedly the capital is the financial centre of Japan, even though Osaka occupies a similar position in respect to the business and industrial life of the Japanese nation.

Defects of Present Banking System of Japan

THE central bank of Japan is the Nihon Ginko, the bank for banks. Its principal function is to regulate the circulation of money. At the same time it is the bank of the nation, it floats the national bond issues, and manages the funds of the national treasury, and has the right of issuing convertible notes. To a certain degree it harmonizes the currency as it is the leader and controller of the financial world. In times of depression or panic it expresses its opinion of the state of the nation, and in times of danger, or alarm it can control business by changing its interest rates. Often when there is a state of reaction in the financial world and private banks show signs of instability the Nihon Ginko will come to its aid, and advance the funds necessary to keep it afloat.

After the war the financial world became very active and eccentricity rules its activities. Speculation filled the thoughts of men and controlled operations in business and finance. In 1919, once in October and again in December, the Bank of Japan raised its interest rate 2 rin a day per hundred yen (about $\frac{3}{4}$ per cent. a year). This brought the financial world up in its course in great alarm, but the effect of the advance in interest was too slight, and eventually it had little effect on the financial world.

Up to March 1920, business expanded in an unhealthy, unnatural manner, under the driving force of unlimited speculation. The smash came on March 15, 1920, when the share market was obliged to suspend transactions for a few days in order to adjust accounts after a big break in the prices of all shares. The world of finance was not able to recover from this shock, and the great reaction of April, 1920, finally shook the business world almost to pieces. At the time of greatest crisis the Bank of Japan advanced a large part of its frunds on shares, cotton yarn, sugar and raw silk in order to relieve the intolerable conditions the panic revealed. It also deposited some of its funds in other banks and thus enabled them to weather the storm which beat about them. In this way the Bank of Japan faithfully observed its duties as the central bank of the nation. However, it was unable to advance money on company shares, and commercial bills. Its transactions in the panic time were limited to advances on bank security, personal transactions were very few indeeed. Consequently its functions as a central bank are not complete, and its defects were exhibited at the time of the panic.

The special banks, the Yokohama Specie Bank, the Nihon Kangyo Ginko, the Nihon Kogyo Ginko and the Noko Ginko, the Hokkaido Takushoku Ginko, the Taiwan and Chosen Ginko, and the Chosen Shokusan Ginko, all have no connection with the organization and functions of the Nihon Ginko. There is little connection between the government and these banks, although at first glance there seems to be a very close relationship between their activities and the government.

The Kangyo Ginko and the Kogyo Ginko were first established to serve different ends. The Kangyo Ginko was to regulate the supply of funds to the country districts, and to supply capital for industrial enterprises, and to act as a central organ for the Noko Ginko of each prefecture. It made loans against immovable property, and the factories of legal corporations, in the towns and cities.

The Kogyo Ginko was to provide funds for loans against valuable securities, against bonds, and shares. But in recent years it has made its principal business lending money to factories and manufacturing companies. The position of the Kogyo and the Kangyo Banks is thus becoming the same, because they are both acting as organs for providing funds for industrial purposes only.

A recent law permitted the amalgamation of the prefectural Noko Ginko with the Kangyo Ginko, and revised the regulations governing its activities, so that the funds raised by the issues of its premium bonds might only be employed in loans for the public benefit not for individual enterprises. But at the same time it is permitted to make loans on immovable property and on factory equipments, by the issue of ordinary bonds, which, however, are only to be made on city property. In this particular the function of the Kangyo and the Kogyo banks are similar. The Kogyo Ginko does not make loans on country property, and the Kangyo does not lend money on bonds and shares. In this alone are they different.

In recent years a supply of funds for industrial purposes has become more and more necessary, so the Kangyo Ginko and the Kogyo Ginko have in great part adopted the same course of business. In fact there is no reason for not making their business one: perhaps this will be the next advance in the Japanese banking system.

The Banks of Chosen and Taiwan

These banks were established because the conditions of money circulation in the colonies were very different from what they were in the home country. Another reason for their establishment is found in the government's fear that the circulation of the notes of the Bank of Japan in the colonies would not be unattended with anxieties, in the existing state of feeling towards Japanese annexation.

To-day conditions have materially altered. In the beginnings of Japanese occupation business conditions were unsettled, now they are stabilized, and the notes of the Bank of Japan are as well known as the notes of the native banks. The arguments that the nation would sustain great loss in the event of rebellion no longer hold good when rebellion is unthinkable, and the right of issue held by the Banks of Chosen and Taiwan is now a remnant of times gone past. The right of issue held by the colonial banks no longer being essential to the development of the colonies the government is preparing to rescind the right and replace the notes in circulation with those of the Nihon Bank. Of course, business conditions in Taiwan and in Chosen, do not always follow along with conditions in Japan, so it is a real convenience to have the Banks of Taiwan and of Chosen. But the right of issue is no longer necessary to them, and it should be withdrawn. The best solution of the issue right would be to amalgamate thJ two colonial banks into one central colonial bank with close connection with the Bank of Japan.

The Futsu Ginko

These banks have developed well without any protection or assistance from the government. But if one is to speak of the weak point of the banking system of Japan, it is to be found in the too great number of small "futsu Ginko", which constitute a real peril to the Japanese financial world. There is no connection between them, and when conditions of finance are good they lend money in a most extravagant careless manner on any kind of security, and so when conditions get a bit upset, or tight, they feverishly call in their loans, and consequently they contribute to make the waves of prosperity and loss vary too greatly in either direction. This is the greatest evil confronting the Japanese banking world, and it is caused by the mass of little banks which do not act together with the nation's great banks to maintain a normal level of prosperity.

Another great evil is that these small bankers are devoid of any settled opinion about money matters. This present big reaction is largely due to the action of these irresponsible bankers. The recent tendency to amalgamate the minor banking interests is a decidedly good one, which should advance the power and influence of the important bankers, and help to stabilize the opinion of Japanese finance in the eyes of the rest of the world.

Japan's Chartered Company

WHEN Japan undertook the task of developing Korea its government followed the precedent created by Great Britain and organized a semi-official chartered company to carry out the work. The Oriental Development Company, Ltd., was established in December, 1908, with a capital of Y.10,000,000, of which Y.3,000,000 was taken up by the government, its statutes providing rigid official supervision over its operation. The government furthermore furnished a subsidy of Y.300,000 for each of the first eight years, which is to be repaid out of excess profits when dividends exceed ten per cent.

The company started work early in 1909, not long before the formal incorporation of Korea in the Japanese empire, an event which doubtless accelerated the company's progress. The program of the undertaking was largely that of a bank making advances to settlers, to groups of farmers and on produce on the way to market. All such loans were repayable by instalments extending over various terms of years — in the case of produce within one year. Loans could also be made on real property, railways and mining concessions, to public corporations and industrial associations, and on the security of shares and debentures of companies engaged in dealing with emigrants, and in development work. Up to 1916, when the company confined its operations to Korea, the average amount of the loans made was small, and, indeed, had a declining tendency, the average falling from Y.5,835 in 1912 to Y.2,803 four years later.

Offices of Oriental Development Company at Seoul, Korea

Then came a revolutionary change in the scope of the Oriental Development Company, for in 1917 the statutes were revised to permit operations in foreign countries. Branches were opened at Mukden and Dairen in that year; in 1919 Kharbin and Tsingtao (formerly German) saw branches established. The company contemplates, if it has not already done so, the establishment of branches in some of the South Sea islands and in New York. The Philippines, Sumatra, Java, Borneo and even New Guinea are included in its potential sphere of operations. A curious fact emerges from the record of the company's achievements recently published in English at Tokyo. Under the influence of war demand for products the average of loans in Korea expanded, but still was modest in comparison with those made in the more distant spheres of operations. In 1917 four-fifths of the loans were made in Korea with an average per loan of Y.4,000, but the Mukden branch had an average of 18,300 and the Dalny (Port Arthur) branch one of Y.8,860. By 1918 the aggregate of loans in Korea had fallen to 56 per cent. of the total advances, and their average was just under Y.5,000, against Y.26,600 for Mukden and Y.8,700 for Dalny.

By 1919 the operations had so far changed their character that of Y.70,257,000 advanced only Y.32,595,500 were lent in Korea, where the average loan had declined to Y.4,700, against Y.37,200 for the Mukden branch, 15,500 for Dalny, 54,500 for Kharbin and 52,600 for Tsingtao. Nine loans attributed to the Tokyo head office give an average of Y.336,800 per loan, Agricultural development still claimed the largest proportion of the 1919 loans, though mining and industries begin to bulk more largely, and transport and communications account for a rapidly expanding sum. It may be presumed that the substantial amount of Y.19,806,200, described as for "streets laying," relates to roads, otherwise it would appear that an organization designed for rural development was paying too much attention to urban facilities. In any case it is evident that the company originally intended to fulfil the duty of assisting production in Korea has increasingly become an instrument for developments in Manchuria, Mongolia and China, which since Europe went to war have had to depend more and more on Japanese capital and enterprise for their advancement.

The extent of lands in Korea in possession of the company which is regarded as constituting its most important asset is 278,000 *chobu* and upwards. It consists of paddy fields for 51,150 *chobu*, upland farm for 20,145 *chobu*, forests for 3,873 *chobu*, residential land for 107,700 *chobu* and lands unclassified for 3,331 *chobu*. Besides the company holds on lease state forests for more than 30,000 *chobu*, the ownership of which is to fall into the hands of the company gratis when it has succeeded in the afforestation. The actual value of all these lands must be not less than Y.70,000,000. Besides, since last year the company has acquired lands and buildings to a considerable extent in China. To give the principal instances, it purchased lands and buildings worth Y.1,700,000 in Tsingtao which had been in the possession of Germans under the control of the Chinese government. With these new acquirements the company started an industrial concern. In Tientsin it purchased similar real estate to the value of Y.700,000 and upwards and opened a sister company therewith. In the same place, or Tientsin the company is to shortly purchase another land and buildings amounting to Y.800,000, approximately.

Japanese Life Insurance Business

AT the end of June, 1921, Japanese life insurance companies had outstanding 3,920,000 policies, for insurance amounting to Y.2,873,000,000. Compared to 1913 the number of policies has increased 200 per cent. and the value of the insurance issued, three hundred per cent.

The course of the life insurance business since 1913 (3) is shown in the following table :—

		Policies Issued.	Insurance Value. Yen
1913	.. ..	1,688,683	963,311,000
1914	.. ..	1,862,369	1,085,083,000
1915	.. ..	1,816,239	1,072,225,000
1916	.. ..	1,849,725	1,130,344,000
1917	.. ..	2,355,365	1,366,394,000
1918	.. ..	2,740,100	1,679,605,000
1919	.. ..	3,328,134	2,222,126,000
1920	.. ..	3,753,747	2,684,188,000
1921, June 30	..	3,920,000	2,873,218,000

The Japanese people were slow in grasping the value of life insurance when it was first introduced to them. During the years under review, however, the constant efforts of the established life insurance companies, and a growth of the idea that the companies were reliable and actually would perform the promises they made,

stimulated activity in life insurance circles, and the number and value of policies issued has most noticeably increased year after year.

Principally important is the increase in insurance issued, during and after the great war, as an effect of the good conditions existing in the financial world. The growth was able to withstand even the panic shock of 1920, and business was but little affected by the depression. However, the influence of the panic is now slowly being felt in a general inactivity in life insurance, particularly noticeable from the number of policies which have been allowed to lapse during the past year.

During the first half of 1920 when the effect of the panic was most severe, 80,000 policies valued at Y.57,000,000 were allowed to lapse. In the second half-year, when things were slowly settling down after the great shake-up, 177 policies valued at $140,000,000 lapsed; a total for the year of 257,000 policies valued at Y.197,-900,000.

This year during the period from January 1st to June 30th, 136,000 policies valued at Y.117,681,000 have already lapsed. This is a very large number, particularly noticeable as such when it is considered that adjustments of policies are made on the company's books at the end of the year, and consequently it may be expected that from July to the end of this year the number of lapsed policies will be much greater than during the first half already reported. Bad financial and industrial conditions are gradually making themselves felt in a gradual oppression of all walks of life in Japan, and life insurance is no exception to the rule, for its figures of business show the condition most pointedly.

During the past seven years the number of policies which have lapsed and their value, is shown in the following table :—

	No. of policies lapsed.	Value of policies lapsed. Yen
1915	294,118	192,874,000
1916	249,252	161,171,000
1917	189,392	129,541,000
1918	156,434	112,242,000
1919	154,752	122,350,000
1920	257,614	197,936,000
1921, June 30 ..	136,639	117,681,000

Naturally, with so many policies lapsing the life insurance companies are obliged to put forth unusual efforts to hold up the amount of business they carry.

New contracts issued during the last seven years were :—

	New Policies.	New Insurance Issued. Yen
1915	267,267	191,840,000
1916	301,583	229,799,000
1917	379,409	300,783,000
1918	488,394	412,278,000
1919	666,209	613,534,000
1920	725,955	685,756,000
1921, June 30 ..	312,776	314,514,000

Under the necessity of increasing their efforts to get new insurance all the companies have been obliged to increase their advertising expenses, and the cost of soliciting has also greatly increased during the past two years. It is not at all easy to decrease these expenses because of the loss of new business it would entail, consequently under conditions existing in the financial and industrial worlds the future of life insurance companies is not considered to be very bright.

Last year, from January to June, the average face value of each new policy issued, was Y.1,006. All the companies are seeking large policy-holders, because it costs them no more to sell large amounts of insurance in one policy than it does to sell a policy for a small sum. But the large policy-holders are allowing their insurance to lapse, and the companies are finding it increasingly difficult to get such insurance. About the largest amount of insurance written by any Japanese company on the life of one man is Y.600,000. There are many policies of Y.100,000 and Y.150,000, written on the lives of some of the most prominent business men of Japan. But compared with the use of life insurance by the big business men of the United States, that particular phase of life insurance in Japan is still in its swaddling clothes.

Since 1916 the government's insurance without physical examination, "kani hoken," has increased the amount for which the average company policy is issued. The government's maximum policy is for Y.250. Premiums are very low, and are payable monthly, and the result has been to take practically all insurance for petty amounts away from the insurance companies, who are not unwilling to see it leave them.

Since 1916, the companies have been able to turn their attention to large amount policies. During the last five years the value of single policies issued has therefore greatly increased. Recently, however, the number of big policies has greatly decreased, as a result of the panic, but even with this set-back the average amount of each policy has increased.

The average value of lapsed policies this year was Y.861, which is a hundred yen greater per policy than last year. Many policies for big amounts have been allowed to lapse during the past nine months, which have been months of the greatest strain and anxiety to many prominent business men and financiers, whom only the direst necessity could have driven to this desperate means of cutting down expenses.

The average value of new policies issued and the average value of policies lapsed for the past seven years are shown in the following table :—

	Average New Policies Yen	Average Lapsed Policies. Yen
1915	718.00	651.00
1916	762.00	647.00
1917	793.00	684.00
1918	829.00	718.00
1919	922.00	791.00
1920	945.00	769.00
1921, June 30 ..	1,006.00	861.00

When the effects of the panic began to be felt in the life insurance world many companies began to reduce their staffs and discharge solicitors. But they are now beginning to regret their scary attitude. Those companies who continued strenuous efforts to get business have been those which have written the most insurance during the past six months, while many companies of previous high standing have lost so much business from lapses and failures to get new policies that their position is highly endangered to-day.

Small companies not particularly active before the panic broke were the most badly hit by the slump. But the big companies have now all gone through the re-adjustment period up to date with colors still flying, even if for some of them those colors are slightly bedraggled.

The latest statistics concerning China's mineral output show that, while that country covers about 7 per cent. of the earth's surface, and has a population equal to a quarter of the whole globe, the mineral production is less than 1 per cent. Out of thirty-two substances enumerated, only antimony and tungsten are above 10 per cent.; tin and mercury above 5 per cent.; zinc, arsenic, coal, asbestos, magnesite and talc above 1 per cent. Substances of fundamental importance to national industry, such as iron, copper, petroleum and sulphur are very insignificant in amount, whilst phosphates, nitrates and potash, so necessary to modern agriculture, have not yet been found in any quantity.

Banking in Korea

By T. HOSHINO

FINANCIAL reforms in Chosen began with the engagement by the Korean government in 1904 of a Japanese financial adviser, and, in a strict sense, may be said to have been finished only with the recent completion of the land surveying work which furnished the government with a true and reliable basis for the taxation of land, which tax constitutes the greatest item of the Korean revenue. Meanwhile Chosen proved no light burden upon the treasury of Japan. During the protectorate régimé large sums of money were defrayed by the imperial treasury of Japan for the maintenance of the residency-general and its affiliated offices, railways, postal, telegraphic and other communication facilities, etc., in addition to naval and military expenses, and the meeting of the deficit in the annual revenue of the Korean government. With the transfer of judicial administration and prisons to the Japanese government in 1909, the maintenance of the law courts and prisons also devolved upon the imperial treasury. The sums thus disbursed by Japan were Y.27,000,000 for the fiscal year 1907, Y.31,000,000 for 1908, Y.21,000,000 for 1909 and Y.25,000,000 for 1910, the last-named including expenses incidental on the annexation. With the annexation the complex system of government was changed into a simpler and more unified one, thus curtailing administrative expenses. A special account of the government-general was established, and by it all government expenses in Chosen were to be met by taxes and receipts collected in the country, and the deficit, if any, made good by the imperial treasury of Japan. During the ten years following there has always been some deficit to be made good by Japan, but so satisfactory has been the progress made in the public finances of Chosen that in a few years no subsidy will be needed to make both ends meet. The satisfactory development of the finances of Chosen will be made clear by the following table, in which the estimates of revenue and expenditure for the past ten years are compared :—

Year	Revenue: Ordinary Yen	Revenue: Extraordinary Yen	Revenue: Total Yen
1910-11	11,953,272	10,368,475	22,321,747
1911-12	25,564,176	26,720,288	52,284,464
1912-13	28,764,740	33,362,154	62,126,894
1913-14	31,347,543	31,745,944	63,093,487
1914-15	35,692,238	26,355,422	62,047,660
1915-16	38,829,330	23,893,165	62,722,495
1916-17	44,764,559	23,437,548	68,202,107
1917-18	46,433,567	28,469,829	74,903,396
1918-19	42,668,220	22,473,433	65,141,653
1919-20	52,642,608	24,918,082	77,560,690

Year	Expenditure: Ordinary Yen	Expenditure: Extra-ordinary Yen	Expenditure: Total Yen	Subsidy from Japan Yen
1910-11	9,916,993	8,340,390	18,257,383	2,885,000
1911-12	25,561,053	20,611,257	46,172,310	12,350,000
1912-13	28,000,278	23,780,946	51,781,224	12,350,000
1913-14	31,690,220	21,764,264	53,454,484	10,000,000
1914-15	32,277,749	22,822,085	55,099,834	9,000,000
1915-16	34,724,853	22,145,094	56,869,947	8,000,000
1916-17	36,188,619	21,374,091	57,562,710	7,000,000
1917-18	31,944,360	19,227,466	51,171,826	5,000,000
1918-19	36,399,704	28,741,949	65,141,653	3,000,000
1919-20	39,698,250	37,862,440	77,560,690	?

Expansion of Financial Market.—Along with the commercial and tradal expansion, the financial market of the peninsula has also greatly broadened. Its relation with Japan has become inseparable, and that with Manchuria is constantly growing closer. Every fluctuation in the money market in Japan is reflected in that of the peninsula, and money is moving with the utmost freedom between the two countries. This is quite natural, since most of the large commercial banks doing business in the peninsula are branches of Japanese banks with the exception of the Bank of Chosen, which, on the other hand, maintains four branches in Japan and transacts a very large business through them, as we shall see later on. On the whole, however, capital comes from across the channel, the truth of which statement may be gathered from the various tables given in the preceding chapter respecting Japanese enterprises in the peninsula, and this influx of capital will increase as the financial power of Japan grows and the natural resources of the peninsula become known to the capitalists at home. The financial relation of the country with Manchuria is the reverse of that with Japan. Money flows out to that country to help develop the great natural wealth it has in store. The chief intermediary in this movement of capital is the Bank of Chosen. In a word, the Bank of Chosen introduces capital from Japan, invests part in Chosen, and employs the rest in Manchuria. The Oriental Development Company, which, though it removed its head office to Tokyo a few months ago, may still be called a Korean company, is pursuing much the same line though on a smaller scale. A large number of other institutions and individual merchants keep offices in both countries, and the ever-increasing business transactions between the two countries are uniting the money markets of both into one great economic community. The fact is the Yalu does not separate the Japanese empire and the Chinese republic so effectively economically as it does politically. To the enterprising, Chosen has proved too small a field, they push on to Manchuria and build up there an economic tie, the like of which is rarely found between two distinct self-governing nations. There is no question either that the prevalence of the Bank of Chosen notes outside the boundaries of Chosen, especially in Manchuria, has contributed to no small extent to this broadening of Chosen's financial relation abroad. In connection with this financial inter-relationship between Chosen, Manchuria and Japan, the following table, giving deposits and advances by the Bank of Chosen in the three countries, will be interesting :—

Year	Chosen Offices Yen	Index No.	Manchurian Offices Yen	Index No.
1910	5,470,415	100	442,516	100
1911	5,905,463	108	471,231	106
1912	13,244,707	242	797,938	182
1913	18,650,968	341	749,156	169
1914	16,055,199	294	1,063,626	240
1915	15,781,898	289	2,084,639	471
1916	17,288,089	316	9,107,316	2,058
1917	20,923,336	382	12,338,345	2,788
1918	31,830,760	582	31,569,073	7,156
1919	38,058,360	696	44,555,475	10,069

Year	Japanese Offices Yen	Index Number	Total Yen	Index No.
1910	47,720	100	5,960,651	100
1911	601,587	1,261	6,978,281	117
1912	127,233	267	14,169,878	238
1913	1,401,802	2,938	20,801,926	349
1914	479,679	1,005	17,598,504	259
1915	722,063	1,513	18,588,600	312
1916	6,638,003	13,910	33,033,408	554
1917	54,690,047	114,606	87,951,726	1,475
1918	146,507,508	307,015	209,907,341	3,521
1919	88,069,490	184,555	170,683,325	2,863

Year	Chosen Offices Yen	Index No.	Manchurian Offices Yen	Index No.
1910	20,125,422	100	134,294	100
1911	20,936,352	104	126,576	94
1912	30,932,585	153	277,216	206

Year	Chosen Offices	Index No.	Manchurian Offices	Index No.
	Yen		Yen	
1913	32,369,242	161	2,550,531	1,899
1914	31,748,900	158	3,308,004	2,463
1915	30,210,422	150	3,681,808	2,744
1916	35,650,426	177	17,010,279	12,665
1917	49,445,650	246	24,299,701	18,094
1918	65,579,266	329	70,640,308	52,601
1919	121,228,886	602	115,760,106	86,199

Year	Japanese Offices	Index No.	Total	Index No.
	Yen		Yen	
1910	1,778,572	100	22,038,288	100
1911	834,682	47	21,897,610	99
1912	1,296,590	73	32,506,391	148
1913	2,612,884	147	37,532,657	170
1914	2,019,109	114	37,076,013	168
1915	8,970,271	505	42,862,501	194
1916	8,968,696	504	61,629,401	280
1917	51,164,429	2,882	124,909,780	567
1918	136,546,846	7,677	272,766,423	1,238
1919	157,159,034	8,382	394,148,026	1,788

Expansion of Currency.—The financial market of Chosen has greatly enlarged its sphere of late, the proof of which may be seen in the volume of currencies in circulation, and the amount of the cheques cleared through the four clearing-houses in the country. The increase in the currency is shown in the following table:

Year	Japanese Currency	Bank of Chosen Notes*	Korean Coins: New Coins	Korean Coins: *Yupchun*	Total	Index No.
	Yen	Yen	Yen	Yen	Yen	
1910 ...	553,476	20,163,900	8,215,785	2,415,288	31,348,459	100
1911 ...	3,619,792	25,006,540	4,947,826	1,573,167	35,147,325	112
1912 ...	4,536,528	25,550,400	3,998,036	1,099,700	35,184,664	112
1913 ...	4,438,167	25,693,260	3,020,124	663,266	33,814,817	107
1914 ...	5,056,221	21,850,370	2,318,233	379,916	29,504,740	94
1915 ...	5,457,359	34,387,520	2,028,848	212,631	42,086,358	134
1916 ...	5,490,386	46,627,080	1,913,320	132,971	54,163,757	173
1917 ...	6,219,125	67,364,950	1,905,099	119,522	75,603,696	241
1918 ...	8,417,610	115,523,671	1,904,305	118,078	125,957,664	401

Remarks: * This being the total issue of the note part is in circulation in Manchuria.

The fluctuations noticeable in the table have been due to a great variety of causes; at one time the import-excess, mentioned before, greatly contracted the currency, while, at other times, especially during the past few years, wartime conditions greatly inflated it. On the whole, however, the currency has expanded through the economic development of the country, which fact is further shown by the amount of the cheques cleared through the clearing-houses in Seoul, Fusan, Chemulpo and Pyeng-yang, the only clearing-houses as yet in the country.

Year	Seoul: No. of Cheques	Seoul: Amount Cleared	Chemulpo: No. of Cheques	Chemulpo: Amount Cleared
		1,000 yen		1,000 yen
1910	59,416	20,490	—	—
1911	167,050	50,527	21,921	9,413
1912	217,727	63,623	26,702	13,698
1913	260,212	64,533	35,413	15,126
1914	284,396	57,331	40,126	13,740
1915	307,061	57,912	42,849	15,874
1916	392,098	81,946	43,613	21,082
1917	490,788	125,960	49,054	32,275
1918	668,398	247,701	57,032	45,435
1919	862,579	572,230	79,427	108,020

Year	Fusan: No. of Cheques	Fusan: Amount Cleared	Pyengyang: No. of Cheques	Pyengyang: Amount Cleared	Total: No. of Cheques	Total: Amount Cleared
		1,000 yen		1,000 yen		1,000 yen
1910 ...	—	—	—	—	59,416	20,490
1911 ...	58,953	12,615	—	—	247,924	72,555
1912 ...	87,510	21,168	—	—	331,939	98,489
1913 ...	111,801	21,621	—	—	407,426	101,280
1914 ...	109,676	19,762	—	—	434,198	90,833
1915 ...	118,100	24,963	—	—	468,010	98,749
1916 ...	133,323	29,898	—	—	569,034	132,926
1917 ...	151,095	44,671	—	—	960,937	202,906
1918 ...	188,497	90,831	82,705	28,504	996,232	412,673
1919 ...	279,934	216,561	120,194	65,596	1,342,134	962,408

Banking Development in General.—With the establishment of the Bank of Chosen all the makeshift measures for banking purposes adopted during the transitory period were done away with, and the peninsula came to enjoy a banking system the same as that of Japan and similar to the one prevailing in the most advanced countries in the world. The currency reform also was all but completed by that time, and the Bank of Chosen notes, the legal tender, had pushed their way into the remotest corner of the country along with the subsidiary coins, which speedily replaced the old ones. The presence of a central bank to regulate and control the financial market as such, and the uniformity of coinage reducing the speculative element in banking operations to a minimum, have of themselves been a great incentive to the development of some banking enterprises. The Japanese banks with branches in Chosen now found themselves in a position to employ their ample resources with much greater freedom and safety and accordingly began to extend their operations. The agricultural and industrial banks, the working of which left much to be desired in spite of their recent foundation, were given active assistance by the newly created central bank, and greatly improved their condition, while the native banks, once on the verge of bankruptcy, regained their vitality and began to show much activity in their own small ways. Some new institutions were also established in the meantime. But the greater part taken in the banking development of Chosen in recent years was that by the central bank itself. Unlike most central banks in the world, the Bank of Chosen is not yet in a position to rest content with the mere rediscounting of bankers' bills. Banks are scarce, so operations performed in most other countries by ordinary banks are in this country performed by the central bank, consequently the development of the Bank of Chosen may be construed not only as the development of a central bank as such but also as the development of the ordinary banking business in Chosen. In the following table is given the balance sheet of all the banks in Chosen combined, including the Bank of Chosen, for the past ten years:—

COMBINED BALANCE SHEET OF ALL BANKS IN CHOSEN

Year	Capital Paid-up & Reserve Fund	Notes Issued	Agricultural Debentures	Deposits
	Yen	Yen	Yen	Yen
1910... ...	7,442,355	20,163,900	990,000	23,829,582
1911... ...	10,987,093	25,006,540	1,870,000	20,064,627
1912... ...	15,556,066	25,550,400	1,780,000	27,837,579
1913... ...	16,806,267	25,693,260	2,990,000	34,436,956
1914... ...	19,681,359	21,850,370	2,910,000	32,320,537
1915... ...	19,911,037	34,387,520	2,319,500	35,626,790
1916... ...	19,165,115	46,733,350*	1,739,000	43,716,742
1917... ...	26,189,543	68,198,369*	3,000,000	53,912,055
1918... ...	41,860,060	116,608,460*	3,000,000	84,647,493
1919... ...	66,511,500	165,299,149*	17,500,000	125,265,571

Year	Government Account	Loans and Bills Payable	Due to Other Banks, etc.	Total
	Yen	Yen	Yen	Yen
1910... ...	2,772,250	3,822,870	3,151,546	62,172,509
1911... ...	2,609,777	9,531,510	3,094,438	73,163,985
1912... ...	3,221,676	9,063,251	5,936,931	88,945,909
1913... ...	3,055,596	9,674,602	4,930,893	97,587,576
1914... ...	3,027,557	12,996,755	4,857,173	97,643,752
1915... ...	3,009,517	8,684,769	5,908,148	109,847,282
1916... ...	2,991,477	8,695,258	7,430,568	130,471,511
1917... ...	2,937,437	16,050,807	10,099,890	180,388,104
1918... ...	2,919,397	21,105,026	16,292,858	286,433,296
1919... ...	2,909,397	38,813,184	28,771,697	445,070,499

*These figures include "Fractional Notes."

Year	Cash in Hand	Money at Call, Bullion, etc.	Bills Discounted and Advances	Investments
	Yen	Yen	Yen	Yen
1910... ...	9,452,255	1,587,623	41,057,255	2,036,735
1911... ...	9,436,781	2,883,426	42,610,753	6,366,007
1912... ...	6,708,251	2,583,360	58,070,479	6,855,202
1913... ...	5,292,536	2,198,378	62,497,923	8,820,418
1914... ...	7,514,325	2,032,447	61,134,526	9,069,872
1915... ...	11,879,528	2,907,166	60,554,756	9,790,775
1916... ...	17,378,733	2,698,007	69,364,977	12,936,239
1917... ...	27,290,904	5,809,480	96,166,298	20,149,772
1918... ...	44,540,036	4,423,253	140,338,617	21,633,509
1919... ...	39,750,585	30,045,098	270,647,755	20,007,154

Year	Due from Other Banks	Bank Premises, etc.	Total
	Yen	Yen	Yen
1910	2,150,997	5,887,649	62,172,509
1911	864,838	11,002,179	73,163,985
1912	770,792	13,957,817	88,945,909
1913	957,932	17,820,386	97,587,576
1914	599,533	17,293,046	97,643,752
1915	1,132,281	23,582,773	109,847,282
1916	1,480,534	26,613,018	130,471,511
1917	1,973,412	28,998,235	180,388,104
1918	6,077,915	69,419,964	286,433,296
1919	5,727,750	78,892,153	445,070,499

Development of Commercial Bank.—In one sense, the Bank of Chosen is the largest commercial bank in Chosen, but it will be dealt with separately on account of its unique character as the central bank. Outside that bank, commercial operations are most largely carried on by the branches of Japanese banks, the most important of which are the Dai Ichi, the Hyaku-sanju and the Juhachi. The history of these branch banks goes far back into the days of the old régimé, and that of the Dai Ichi Ginko has already been given. To the credit of these banks it may be said that it was due to a large extent to their untiring efforts that anything like banking credit existed in those troubled days of old. The Dai Ichi Ginko is the most important of these, and although its one time importance as the *de facto* central bank of Chosen has long since vanished, it still occupies a place in the peninsular financial world next only to the Bank of Chosen. Three native banks, the Hansung, the Chosen Commercial and the Han-il, have also developed into small yet sound institutions indispensable to native merchants. Further, a new leaf has been turned of late in native banking history by the establishment by the Hansung Bank of a branch office in Tokyo. This event, trifling as it may seem of itself, is pregnant with significance as indicating the new spirit of enterprise now awakening in the native business community. The following list gives the names, number of branches, capital and date of establishment of the 19 commercial banks now doing business in Chosen :—

Bank	No. of Offices	Capital	Date of Establishment
		1,000 yen	
Dai Ichi Ginko	2	800*	May 4, 1878.
Juhachi Ginko	8	1,650*	January 1, 1880.
Hyaku Sanju Ginko	4	650*	July 20, 1882.
Mitsuyo Ginko	1	50	March 1, 1907
Sichisei Ginko	1	435	August 1, 1912.
Keijo Ginko	2	1,000	September 5, 1913.
Hansung Bank	9	3,000	February 7, 1903.
Chosen Commercial Bank ...	8	1,000	March 7, 1899.
Han-il Bank	5	500	August 8, 1906.
Ho-soh Bank	2	300	July 4, 1913.
Sanwa Ginko	1	300	November 10, 1916.
Taiku Bank	3	500	July 7, 1913.
Sennan Ginko	1	300	September 2, 1912.
Kyung-nam Bank...	3	500	September 21, 1912.
Fusan Shogyo Ginko	4	500	April 21, 1913.
Shingishu Ginko	1	500	November 24, 1917.
Tong-nai Bank	1	500	September 14, 1918.
Pooksun Commercial Bank ...	1	500	October 2, 1918.
Wonsan	1	500	February 28, 1919.
Total	58	13,485	

*These figures do not represent the full amount of capital, but that part registered as the capital of its branch offices in Chosen.

The development of these commercial banks is shown in the following table :—

Liabilities

Year	Capital Paid-up and Reserve Fund	Deposits	Government Account	Loans
	Yen	Yen	Yen	Yen
1910... ...	4,239,530	9,684,026	285,720	303,265
1911... ...	4,967,030	9,538,360	265,097	550,763
1912... ...	6,263,729	10,123,218	541,696	1,315,566
1913... ...	7,224,983	11,186,062	385,616	1,732,263
1914... ...	7,421,160	11,546,518	367,577	1,675,212
1915... ...	7,575,615	13,388,514	349,537	1,380,321
1916... ...	6,678,200	18,411,330	331,497	861,769
1917... ...	7,483,883	23,254,304	277,457	3,314,050
1918... ...	9,722,850	37,570,630	259,416	3,574,975
1919... ...	13,061,750	52,323,767	249,416	11,007,340

Year	Due to Other Banks	Other Liabilities	Total
	Yen	Yen	Yen
1910	500,240	3,231,199	18,243,980
1911	569,833	3,957,169	19,848,225
1912	651,387	3,525,134	22,420,730
1913	630,702	3,959,582	25,420,730
1914	624,477	4,918,960	26,553,904
1915	1,029,717	3,276,102	26,999,809
1916	1,137,683	3,723,314	31,143,738
1917	1,439,115	5,581,972	41,350,781
1918	2,751,305	8,631,352	62,510,530
1919	3,544,150	15,854,769	96,041,194

Year	Cash in Hand	Money at Call, etc.	Bills Discounted and Advances	Investments
	Yen	Yen	Yen	Yen
1910... ...	887,615	1,089,705	14,298,040	98,495
1911... ...	905,397	534,614	13,038,369	725,770
1912... ...	1,036,356	458,535	16,681,135	1,414,552
1913... ...	1,144,867	267,305	18,545,058	1,470,627
1914... ...	761,582	450,648	17,830,979	1,482,962
1915... ...	860,200	681,913	18,881,554	1,995,342
1916... ...	1.270,523	774,939	21,048,121	2,278,615
1917... ...	2,330,642	963,448	29,093,394	3,306,886
1918... ...	4,016,570	1,355,876	44,968,721	3,541,058
1919... ...	4,816,102	1,838,075	78,385,229	2,682,707

Year	Due from Other Banks	Bank Premises, etc.	Total
	Yen	Yen	Yen
1910	524,774	1,345,351	18,243,980
1911	3,033,904	1,610,171	19,848,225
1912	363,116	2,567,036	22,420,730
1913	352,900	3,338,469	25,119,226
1914	207,213	5,820,519	26,553,903
1915	399,898	4,182,897	27,001,804
1916	515,035	5,256,560	31,143,793
1917	724,955	4,931,456	41,350,781
1918	996,648	7,631,655	62,510,531
1919	1,452,787	6,866,292	96,041,194

Development of Agricultural and Industrial Banks.– These banks, which played so important a figure in the banking history of Chosen, have ceased to exist since September 30, 1918, when they were amalgamated into one large institution, the Chosen Industrial Bank. This amalgamation, however, does not signify that the older institutions failed in their object, or in their business, nor does it signify that their services were no longer needed. It is true that they had many shortcomings, and that these became more and more evident as they drew nearer to the end of their existence, but on the whole their career was one of development and useful service. At the time of annexation there were in Chosen six agricultural and industrial banks, their number which was once nine having been reduced to six by amalgamation, and these with their numerous branches, 41 on September 1, 1918, covered fairly well the whole peninsula. In almost every place, of commercial or agricultural importance, one of their branches could be found, and, inadequate as they were in the means at their disposal and in their equipment, proved indispensable credit-givers in their respective localities. Excellent service was also rendered by them in the form of assistance given to the central bank in the prosecution of its financial programs, the notable case being the withdrawal of the old debased coins and the dissemination of the new ones. On the other hand, the Bank of Chosen was not slow in helping them out of the difficulties into which some of them fell on more than one occasion. Through their very nature they displayed a constant tendency to lock up their funds, which, by the way, consisted of capital, proceeds of debentures, and government loans, in land and other immovables, and this made the timely assistance by the Bank of Chosen all the more necessary. It was once observed that they acquitted themselves rather poorly of their first duty, that of supplying agricultural funds, but then they had to deal with one of the most difficult banking problems in any country, viz., agricultural credit. They were certainly no less successful than most of the institutions of the same kind in Japan. In the following table are given their names, capital, and so forth as they were in September, 1918, just before the amalgamation :—

Banks	Capital Sub-scribed	Capital Paid-up	Re-serve Fund	De-posits	Loans	De-bentures	Govern-ment Account
	1,000 Yen	1,000 Yen	1,060 Yen	1,000 Yen	1,000 Yen	1,000 Yen	1,000 Yen
Kanko Noko Ginko...	1,000	550	148	2,879	4,906	1,000	462
Keisho Noko Ginko...	600	300	167	2,765	4,006	600	290
Heian Noko Ginko...	200	200	18	2,432	3,789	500	396
Jenshu Noko Ginko...	300	150	104	1,451	2,061	430	60
Koshu Noko Ginko...	300	150	73	1,421	1,772	370	90
Kankyo Noko Ginko	200	119	95	2,180	2,218	100	160
Total	2,600	1,469	606	13,130	18,755	3,000	1,459

Their development may be gathered from the following table :

Year	Capital Sub-scribed	Capital Paid-up	Re-serve Fund	De-posits	Loans	De-bentures	Govern-ment Account
	1,000 Yen	1,000 Yen	1,000 Yen	1,000 Yen	1,000 Yen	1,000 Yen	1,000 Yen
1906... ...	1,100	508	7	163	919	450	818
1907... ...	1,200	588	37	511	2,203	450	1,003
1908... ...	,,	555	108	752	2,681	1,050	1,094
1909... ...	,,	,,	114	2,182	4,124	1,050	1,134
1910... ...	,,	,,	144	3,223	6,344	990	,,
1911... ...	,,	818	185	4,140	8,509	1,780	,,
1912... ...	2,400	1,348	386	4,469	10,456	1,780	1,479
1913... ...	2,600	1,467	479	4,599	11,583	2,990	1,469
1914... ...	,,	1,469	486	4,718	11,554	2,910	1,459
1915... ...	,,	,,	487	6,456	11,462	2,319	,,
1916... ...	,,	,,	440	8,017	12,713	1,739	,,
1917... ...	,,	,,	552	9,734	17,664	3,000	,,

Development of Credit Associations.—The local credit association in Chosen is perhaps one of the smallest institutions of the kind, at least when taken individually. In its earlier days the funds at the disposal of each association were confined to Y. 10,000 contributed by the government, and though in later days this sum was augmented by subscription to its shares by members and by members' deposits, the amount disposable was never anything considerable. But it may be said that the very efficiency of the association rested in its smallness, which matched well the condition of the Korean peasants in days gone by. A change, however, became needful as time progressed and the economic power of the peasantry increased, so the association regulations, originally enacted in 1907 and revised in 1914, were revised for the second time in 1918, and, as the result, not only has the scope of their operations been largely extended, but it has also been made possible to create under the same regulations town-associations administering to the needs of petty traders and merchants. The main points of the changes introduced by the new regulations may be summarized as follows :

The amount of a share hitherto fixed at Y. 10 was extended to a sum not less than Y. 10 and not more than Y. 50; the principle of election was recognized in the appointment of its officials, exceptions being made of certain associations for which Japanese managers appointed by the government are required as hiherto; the association was authorized to issue warehouse-warrants on the goods deposited with it by its members; it may act as an agent for any bank; and last, but not least, associations in urban districts were authorized to engage in bill discounting.

In a word, the associations are being turned into so many small banks to serve the poorer people of every class. These institutions are scattered all over the peninsula, 391 in all, and can be approached by any farmer desirous of obtaining funds on reasonable grounds. Their development in the past is shown in the following table :—

Liabilities

Fiscal Year	Capital	Founda-tion Fund	Reserve Fund and Balance from Pre-vious year	Loans	De-posits	Other Liabili-ties	Total
	1,000 Yen	1,000 Yen	1,000 Yen	1,000 Yen	1,000 Yen	1,000 Yen	1,000 Yen
1910... ...	—	1,170	59	279	—	170	1,679
1911... ...	—	1,530	159	345	—	132	2,166
1912... ...	—	1,890	275	406	—	142	2,714
1913... ...	—	2,080	396	441	—	541	3,459
1914... ...	71	2,334	491	465	108	474	3,944
1915... ...	177	2,467	530	476	294	360	4,307
1916... ...	309	2,570	583	470	458	655	5,047
1917... ...	494	2,679	682	547	736	1,292	6,433
1918... ...	709	2,682	812	959	1,405	2,527	9,096
1919... ...	1,627	2,884	899	10,445	5,502	6,065	27,424

Assets

Fiscal Year	Ad-vances	Premises, etc.	Money at Call	Other Assets	Cash on Hand	Total
	1,000 Yen	1,000 Yen	1,000 Yen	1,000 Yen	1,000 Yen	1,000 Yen
1910 ...	762	61	497	59	298	1,679
1911 ...	1,182	98	566	53	265	2,166
1912 ...	1,725	150	636	8	194	2,714
1913 ...	2,158	266	435	417	180	3,459
1914 ...	2,147	361	728	552	154	3,944
1915 ...	2,127	411	1,251	385	131	4,307
1916 ...	2,818	428	1,121	553	124	5,047
1917 ...	3,761	512	889	1,131	138	6,433
1918 ...	5,144	535	736	2,499	180	9,096
1919 ...	18,329	673	1,780	6,011	628	27,424

The Closing of the Agricultural and Industrial Banks and the Establishment of the Chosen Industrial Bank.—We have already pointed out that the Agricultural and Industrial Banks, though excellent institutions in themselves, had many shortcomings, and these became more and more evident as they drew nearer to their closing days. The fact is that the times had changed and old institutions had to be made conformable with the altered state of things sooner or later, and, in this case, the alteration was made by closing the older institutions and establishing a new one. One of the principal shortcomings of the Agricultural and Industrial banks was the lack of unity and co-operation between them. With different business districts, boards of directors, and wide disparity in capital and other resources, and varying in degree of soundness or unsoundness, each was wont to go its own way, making it extremely difficult, if not impossible, to secure the much needed co-operation and mutual assistance which, if secured, would have benefited all. In many cases funds were found lying idle in one bank while another was hard pressed for them. Another of their shortcomings was the inadequacy of capital. At the time of amalgamation the capital of the six banks amounted in the aggregate to only Y. 2,600,000, and that of the smallest one to Y. 200,000 only, and although they were granted government loans their funds proved far from sufficient. In short, not one of them could have been anything but a weak institution had it not been backed by the government, whereas, combined together with capital sufficiently enlarged, they were capable of being formed into a strong institution standing on its own feet, and firm enough to inspire confidence on its own merit. To remove these defects, several views were advanced, some of which favoured the establishment of a hypothec bank, such as the one in Japan, to act as the central bank, leaving the agricultural and industrial banks essentially as they were. Somehow, these opinions were dropped, but a law was issued in June, 1918, authorizing the establishment of the Chosen Industrial Bank with a capital of Y. 10,000,000, into which all the agricultural and industrial banks then in existence were to be absorbed. The shareholders of the old institutions were given share for share in the new institution, and the balance was placed on the market for public subscription. On the 1st of October, 1918, the Chosen Industrial Bank came into being, at the same time the older institutions were closed and their business transferred to the new bank. As far as appearance goes this produced but little change, since all the offices of the Agricultural and Industrial Banks, both head and branch offices, were converted into branches of the new bank, with the exception of the one in Seoul which was made the head office. But, in the internal management a complete change was made. Mr. T. Mishima, senior director of the Bank of Chosen, was appointed president of the bank while still remaining director of the Bank of Chosen. One of the directors was further chosen from the staff of the same bank, while not one director was supplied by the former institutions, although a great majority of the staff remained officials of the new bank. Thus the Chosen Industrial Bank entered upon its career in the 1st of October, 1918, quite new in most respects, yet with 46 branches, a built-up business, and a body of well-trained men. The business of the bank was, as is natural, the same in the main as that of the old agricultural and industrial banks, but some new additions were made in order to meet the fresh requirements called forth by the recent agricultural and industrial development. The following is a brief summary of

its business :—(1) to make loans on the security of immovable property or the rights to immovable property, redeemable in annual instalments within a period of thirty years, or in one sum within a period of five years ; (2) to make loans on the security of fishing rights, redeemable in one sum within a period of five years ; (3) to make loans of the description of (1) on the security of foundations organized by law ; (4) to make loans without security on the joint signatures of 20 or more farmers or industrials, redeemable in one sum within a period of five years ; (5) to make loans of the description of (1) without security to public bodies ; (6) to make loans of the description of (1) without security to credit associations, fishery associations, and similar other legal persons, the object of which is not money making ; (7) to make loans on the security of the native products of Chosen or the goods necessary for native industry ; (8) to make loans on national loan bonds or other bonds approved by the government-general of Chosen ; (9) to deal in bills of exchange with or without documents ; (10) to subscribe to or underwrite debentures of public bodies or of companies whose object is to engage in industrial works in Chosen ; (11) to engage in trust business ; (12) to receive deposits of money, or of gold and silver buillion, and documents of value for safe keeping, etc.

The bank is authorized to issue debentures to the extent of ten times the amount of its paid-up capital, and also to engage in the business of a commercial bank for the time being.

It is yet too soon to dwell upon the doings of this new institution, but the following statement will show something of the activity it has already launched upon :—

Chosen Industrial Bank
Balance Sheet, December 31, 1919

Liabilities	Yen
Capital and reserve fund	8,684,750.00
Agricultural deventures	17,500,000.00
Deposits	34,883,443.72
Government account	1,459,980.60
Loans	11,297,402.46
Due to other banks	2,961,267.06
Other liabilities	2,115,261.43
Total	78,902,105.27
Assets	Yen
Cash in hand	5,068,685.55
Agricultural advances	29,371,697.42
Other advances	41,684,022.13
Investments	562,384.25
Due from other banks	616,249.02
Bank premises, etc.	1,599,066.90
Total	78,902,105.27

Banking in Manchuria

By T. HOSHINO

THE origin of banking in China is enshrouded in mystery. But it is recorded that in the reign of Emperor Hsien Tsung of the Tung Dynasty (806-821 A.D.), there prevailed in China a method called *feichien* (flying money) by which one could pay in money at a government office in the capital and receive in exchange therefor a bill which he might present at a local government office for encashment. This was apparently the origin of bills of exchange in China. Much the same method obtained in Korea under the name of *wei-hwek*, in which the indebtedness of a local office to the central and *vice-versa* were availed of as a means of remittance.

There are at present three types of native banking in China represented by the *piaochuang*, *chienchuang* and *yinlu*, and it is interesting to note that these three types had three different origins and developed along lines greatly differing from one another.

About 280 years ago there was established in the province of Shanhsi a private institution with a view to engaging in the remittance of money from one place to another. It being successful, many similar institutions came into being, and all these were called by the general name of Shanhsi Piaochuang. The business of these institutions was first confined to the remittance of money, but it was extended, as time went by, to other lines of business, until it came to include nearly all the branches of what we now call banking. They established branches and correspondents at nearly all the important points of the Chinese empire. including Manchuria, and the influence exercised by them was at one time so great that it seemed to monopolize the financial business of that great empire. Such was the origin of the once famous Shanhsi Piaochuang.

Again, the disorderly state of currency existing in China for many centuries past called into being a horde of money-changers, whose business was to exchange one local coin for another and get profit out of the exchange. The progress of the inter-provincial trade in the sequel of the opening of Shanghai made the demand on this business so much the greater, and in consequence those engaged in the business grew in number as well as in wealth. These also began to receive deposits, make advances, issue bills of exchange, and generally carry on banking business. Thus were originated what now go by the name of *chienchuang* or *chienpu*.

Then there were silversmiths called *yinlu* engaged in the making of sycee, and these also developed their business into banks, in so far as they received deposits from customers, and effected monetary settlements between such customers by mere book transfers, thus eliminating the use of actual money. This gave birth to that famous system of the "transfer tael" in Newchwang.

Thus the *piaochuang*, *chienchuang* or *chienpu* and *yinlu*, which represent the three principal types of native banking in Manchuria as well as elsewhere in China, sprang from three distinct origins, and it is interesting to note that, though their functions are now largely intermingled, each still retains some of its old traits.

The practice of raising money by pawning goods has also been in evidence in China from time immemorial, and, as far back as the period of Tung, we see restrictions placed on the amount of interest and regulations as to the manner in which interest is added to the principal.

All these bank-like organs exist to-day, though both *piaochuang* and *yinlu* have now practically disappeared from Manchuria except in Antung where, strange to say, both these institutions still exist, though what they now enjoy is but the shadow of their former prosperity. We will not go, therefore, into details of these institutions, but go straight on to a description of the *chienpu*, which, though shorn of much of its former importance, still plays an active rôle in the Manchurian money market.

The *chienpu*, also called *chienchuang* or *yinhao*, is generally of partnership organization with a capital ranging from *Yuan* 50,000 to 200,000. They exist in almost every town, and the small ones, faithful to their tradition, still make money-changing their principal business. But the larger ones receive deposits, make advances, issue bills of exchange, and also the notes which we described as *tiehtzu* in the previous chapter, and further engage in the sale and purchase of moneys. Take a *chienpu* in Changchun, where they prosper most, and examine its working a little. The deposits are divided into the current and fixed. On current accounts no interest is paid, but on fixed deposits interest is paid at the rate of something like 5 per mille monthly, making 6 per cent. per annum. Though no interest is paid on current deposits the accounts amount to a considerable sum with some *chienpu* and

are made the source of many profitable operations. The payment made through the *chienpu* is called *chenma*, and is effected by the depositors informing his *chienpu* of the amount to be paid and the name of the beneficiary. Advances are made on personal credit, with or without the guarantee of a surety and rarely on collateral securities. The term is three months at the longest, ordinarily one month. The rate of interest is, of course, subject to the market rate, but generally 1 per cent. per month. To reliable customers, the *chienpu* is always ready to allow an overdraft to a certain extent, changing them more or less high interest. Since advances are as a rule based upon personal credit, they keep more than ordinary vigilance over the financial condition of their customers. They are rather inclined to refuse advances altogether than to demand collateral securities. The exchange operations of the *chienpu* are confined to the local remittance of money, and are generally on a very small scale. Those on larger scale were formerly conducted by the *piaochuang* and at present by the banks of modern type.

Pawn-Shops.--Pawn-shops are found in almost every place in Manchuria. The largest is called *tang*, the next in size *chihtien*, and the smallest *ya*. These constitute practically the sole monetary organs accessible to farmers, petty merchants and the lower classes of the people generally. The large pawn-shops, called *tang*, are often affiliated to the banks of modern type, and are established sometimes by men of high official position, with a capital upward of *Yuan* 50,000. Thus the Kung Chi Tang, a large pawnshop with offices at Mukden, Newchwang, Antung and Chengchiatun, is a subsidiary organ to the Three Eastern Provincial Bank, while the Kirin Government Bank has also a pawn-shop attached to it. Also in Newchwang there is a pawn-shop called San Hui Tang largely financed by provincial officials of position.

The rate of interest charged by the pawn-shops ranges from 2 to 3 per cent a month, while the term is often prolonged to one or two years. The articles pawned consist chiefly of clothing, followed by jewelery. In small pawn-shops called *ya* the interest is much higher, being 4 to 8 per cent. a month, and the term rarely exceeds four months. The private notes called *tiehtzu* are largely issued by pawn-shops, and there are places, such as Chinchou, where the note-issue is practically limited to them. The private notes, issued by the San Hui Tang above referred to, enjoy a credit unsurpassed by any native bank-note.

Native Banking of Modern Type.--Modern banking in Manchuria, so far as our knowledge goes, dates from 1897, when the Russo-Chinese Bank established its branch office in Newchwang. In all probability the English had a monetary organ to serve their interests, presumably an agency of the Hongkong & Shanghai Banking Corporation, but we have at hand no data to prove the fact. The Yokohama Specie Bank opened its branch in Newchwang in 1900. The establishment of modern banks by the natives belongs to the period following the Russo-Japanese war, and the Mukden Government Bank (now Three Eastern Provincial Bank) which was founded in 1905 may be regarded as the first institution of the type ever established in Manchuria. An institution, which afterwards became the provincial bank of Kirin, was established at Kirin as early as 1898, but it is doubtful if it could properly be called a bank of modern type at the time of its establishment, its very capital then being unknown to a certainty.

At the end of May, 1919, there were altogether 22 native banks of the modern type in Manchuria, 10 of which had their head offices in South Manchuria, and 12 in North Manchuria. Besides, there were four banks having head offices in China proper. These 26 banks, with their branches and agencies, cover well-nigh all the important points of Manchuria, and outwardly Manchuria is by no means destitute of modern banking facilities administered by the natives. But a closer observation will reveal the fact that these institutions, modern to all appearance, are, with a few exceptions, not modern in their practice. They publish no statements, so that the public is left in the dark as to their financial standing. Nearly all of these institutions are vested with the power of note-issue, which however has been abused to the last extreme. Speaking generally, most of these institutions are financially weak, and have no such credit as banking institutions in other countries generally have in their respective communities. But it would be too much to say that they are useless or even harmful in all cases. Poorly backed as they are by specie, with payment often suspended, their notes still circulate, though always at a discount, and are nevertheless indispensable for the trade and commerce of the country. Nor is their superiority to the banks of the old style to be doubted for a moment, for since their appearance all the business hitherto conducted by the old-style bank is gradually passing into their hands. The root of the evils, it appears, is in the chaotic state of currency, and in the lack of strong central authorities to enforce the laws and regulations which are, as we have seen, in the main excellent.

The difference in nature of these native institutions may be inferred to some extent from their names. The provincial government banks are endowed more or less with the nature of a central bank, the Mukden Industrial Bank and the Territorial Bank, with the nature of an industrial bank, and the Bank of Communication with that of an exchange bank. But these differences are more nominal than real. Owing to the fact that, as noted above, no statement whatever is published by these banks, it is difficult to gauge their condition. One of the Japanese periodicals in Manchuria, the *Mammo-jitsugyo-iho*, has published a table showing the financial status of the native banks in Mukden, as they stood at the end of June, 1918. In the absence of any other information, this is given below in all its incompleteness.

Banks	Deposits			Advances		
	Government	Public	Total	Government	Public	Total
	1,000 *Yuan*	1,000 *Yuan*	1,000 *Yuan*	1,000 *Yuan*	1,000 *Yuan*	1,000 *Yuan*
Three Eastern Provincial Bank	1,395	1,205	2,600	500	4,085	4,585
Mukden Industrial Bank ...	?	?	?	1,000	2,000	3,000
Mukden Branch of the Bank of China	1,000	230	1,230	150	500	650
Mukden Branch of Communication Bank ...	400	300	700	200	400	600
Mukden Branch of the Territorial Bank	?	?	?	100	2,000	2,100
Mukden Branch of the Amur Govern't. Bank ...	?	?	?	50	50	100
Mukden Commercial Bank	?	500	500	?	1,441	1,441
Total	2,795	2,235	5,030	2,000	10,476	12,476

A glance at the above table, which, if not correct in details, may at least be taken as indicative of some of the principal features of these banks, will at once show that the deposits are exceedingly small as compared with the advances. This is due to some extent to the conservativeness of the people, but the small credit enjoyed by the banks must largely account for it. Many of the people think it safer to keep their money in their strong box, or to place it in the care of some big merchants or rather of the *Chienpu*. The result is that these banks must seek other resource for their loanable funds. Nor can they depend upon their capital, which is generally very small, and the difficulty of increasing it is easily imagined from the fact that, with the credit of the Bank of China, it was no easy matter for the authorities to find subscribers to its new shares. The two main sources of funds being thus but slightly available, the only course open to them is the note-issue, and with what freedom this course was resorted to by the native banks has been pointed out. Under these circumstances, the growth of the deposit banks, which in other countries are the bones and sinews of their financial structure, is hardly possible in Manchuria.

The abhorrence with which the commercial public regard the contract of loans on collateral securities is another obstacle in the way of the healthy development of banking. Most advances are made on personal credit, or at best on the guarantee of friends of the borrowers. It is clear that no sound banking can exist so long as this custom obtains.

Interest charged by such large banks as the Three Eastern Provincial Bank, the Bank of China, or the Bank of Communication is said at this moment to range between 12 to 16 per mille monthly (14 to 19 per cent. per annum), that by the Territorial Bank from 14 to 20 per mille and that by the Mukden Commercial or

Huafu Industrial Bank from 14 to 22 per mille. In addition to this, the borrower has to pay extra as commission to the bank's officials—another objectionable feature in native banking—and also to his surety. Thus it will be seen that money costs pretty dear in Manchuria, but there is no wonder in this, when the risk of depending purely on personal credit, by no means always very solid, is taken into consideration.

Deposits are received on current account or for a fixed term. The rate paid on them is said to be 9 per cent. for a fixed deposit, and about 3½ per cent. for current deposit, but actually seems to be considerably lower. They certainly could not afford to pay much on their deposits when they have a more profitable source of funds in issuing notes, for which no adequate reserve is usually kept.

Japanese Banks.—Japanese banking in Manchuria dates from 1900 when in January of that year the Yokohama Specie Bank opened a branch office at Newchwang. The following few years saw the bank make a rapid progress, thanks to the constant growth of Japan's trade with Manchuria, to which the bank in its turn made an important contribution. In January, 1903, it issued its first notes in Manchuria. On the outbreak of the Russo-Japanese war, the bank was compelled to close its Newchwang branch, but when the port was occupied by the Japanese the following year, not only was the branch re-opened, but new offices were established at Dairen, Liaoyang, Mukden and Tiehling, as these places were occupied one after the other by the Japanese troops, and these were made the so-called cash offices of the Manchurian armies of Japan. After the war the bank was entrusted by the Japanese government with the task of withdrawing its military notes diffused during the war, and also of generally assisting in the promotion of the trade between that country and Manchuria. More branches were subsequently established in Changchun, Harbin and Kaiyuan, and with its general office, first at Newchwang and then at Dairen, the bank came to enjoy much the same position as the one once enjoyed by the Dai Ichi Ginko in Korea. It is indeed a strange coincidence that both these banks were destined at a later period to transfer much of the business in their respective fields to the one and the same bank, the Bank of Chosen.

But the Yokohama Specie Bank, whose leading business was in the line of exchange, fell in many instances short of the demand made on it by the Japanese public in Manchuria, who required long term loans in order to finance their enterprises, and these the bank could not afford to grant from its very nature. But the drawbacks were remedied to some extent through the government measure, by which the Bank of Japan was called upon to make to the bank a low interest loan of Y. 3,000,000, later increased to 5,000,000, to be used for these specific purposes.

In 1906 a Chino-Japanese Joint Stock Bank called Shoryu Ginko was established with a capital of 300,000 silver yen at Newchwang with a branch at Dairen. The result of its business in its initial stage was anything but satisfactory. It was in consequence completely reorganized in 1911, its capital being increased to 700,000 gold yen and 300,000 silver yen all paid up, while its head office was removed to Dairen. After that the progress of the bank was phenomenal. It is now the largest bank having its head office in Manchuria and managed by Japanese. To cope with the expansion of its business the bank's capital was increased to Y. 3,000,000 in 1905.

Subsequent to the establishment of the Shoryu Bank a large number of Japanese and semi-Japanese banks were established. But the most significant event in the financial history of Manchuria of recent days is the appearance of the Bank of Chosen in Manchuria. Of the progress of this important institution, details will be given later on, but to summarize its career, this peninsular Bank has had a branch in Antung ever since its establishment, transferred to it by its predecessor, the Dai Ichi Ginko, but for various reasons the bank remained inert so far as its Manchurian business was concerned. Meanwhile the bridge over the Yalu was completed, the reduction by one-third of the regular tariff on land trade came into force, and all this resulted in a great development of trade between that peninsula and Manchuria. Moreover, such was the trade condition of the peninsula at that time that, unless the bank extended its sphere of business to adjacent countries, it was difficult for it ro maintain its specie reserve. Prompted by these various reasons the Bank of Chosen appeared in the Manchurian financial field, and, without being aggressive, so great was the demand made on it that its business was soon found expanding in all directions, outstripping many older institutions, not excepting even the Yokohama Specie Bank. There is little wonder in tfiis, however, for the Bank of Chosen partaking of the character of a colonial bank is decidedly the better fitted of the two, for the services required in Manchuria.

Finally, in December, 1917, the various privileges hitherto enjoyed by the Yokohama Specie Bank were made over to the bank, making the latter the central bank of Japanese Manchuria.

Another Korean institution entered Manchuria in 1917. That was the Oriental Development Company. Originally established to engage in Chosen in the colonization and exploitation of the country, the company was later enabled by a revision of its laws to extend its work outside the peninsula. It established branches in Mukden and Dairen in October, 1917, took over the business relative to the industrial funds elsewhere explained from the Yokohama Specie Bank, and made itself the chief supplier of industrial credit in Manchuria. The chief feature of the banking department of this company is in the great variety of the securities upon which loans are made, including mining rights, lands, houses, factories, forests, railroads, etc., either direct or through other institutions. Its activity in Manchuria is best shown by the fact that during the period of about one year ending February, 1919, the total amount invested by it aggregated no less than Y. 11,300,000. The company has further acquired interest in some 18 companies, mostly through subscription to their shares. The Tosho Jitsugyo Kaisha, capital Y. 3,000,000, is a company of its creation, and closely affiliated to it in business. The principal business of this company consists in loans on products, estates, etc.; buying and selling of products on its own account or on account of third parties; trust and guarantee business; subscription to shares and debentures, etc.

JAPANESE BANKS IN MANCHURIA
(Conditions as on May 31, 1919)

Name of Bank	Date of Establishment	Authorized Capital Yen	Paid up Capital Yen	Location of Head Office	No. of Branch Offices in Manchuria
Bank of Chosen	...Oct. 1909	40,000,000	30,000,000	Seoul	18
Yokohama Specie Bank	Feb. 1880	48,000,000	42,000,000	Yokohama	6
Dairen Commercial Bank ...	...Nov. 1918	2,000,000	500,000	Dairen	—
Dairen Bank	...Dec. 1912	1,000,000	575,000	Dairen	1
Sung Hua Bank	...May 1914	1,000,000	362,500	Harbin	—
Educational Savings Bank ...	...Sept. 1900	500,000	200,000	Tokyo	1
Changchun Bank	...Jan. 1918	350,000	175,000	Chngchun	2
Trade Bank ...	...Aug. 1913	200,000	50,000	Tiehling	—
Changchun Business Bank ...	...Jan. 1918	200,000	100,000	Changchun	—
Wafangtien Bank	...Feb. 1918	100,000	50,000	Wafangtien	—
Szupingchieh Bank	...Feb 1918	70,000	17,500	Szupingchieh	—
Tiehling Bank	...Mar. 1908	50,000	31,250	Tiehling	—
Commercial & Industrial Bank ...	...Apr. 1913	50,000	25,000	Liaoyang	1

CHINO-JAPANESE BANKS IN MANCHURIA.
(Conditions as on May 31, 1919)

Name of Bank	Date of Establishment	Authorized Capital Yen	Paid up Capital Yen	Location of Head Office	No. of Branch Offices in Manchuria
Syoryu Bank ...	...July 1906	3,000,000	3,000,000	Dairen	9
Manchurian Commercial Bank ...	...May 1911	1,400,000	425,000	Antung	2
Lungkow Bank	...May 1913	1,000,000	750,000	Dairen	—
Liaoyang Bank	...June 1916	1,000,000	295,000	Dairen	5
Mukden Bank ...	...Dec. 1918	1,000,000	250,000	Mukden	—
Antung Bank ...	...May 1911	500,000	300,000	Antung	4
Tiehling Chino-Japanese Bank ...	...May 1918	300,000	75,000	Tiehling	—
Port Arthur Bank	...May 1918	150,000	37,500	Port Arthur	—
Pitzuwo Bank ...	...Jan. 1917	100,000	50,000	Pitzuwo	—
Fanchiatun Bank	...Oct. 1917	100,000	50,000	Fanchiatun	—

(*Continued on page 260*)

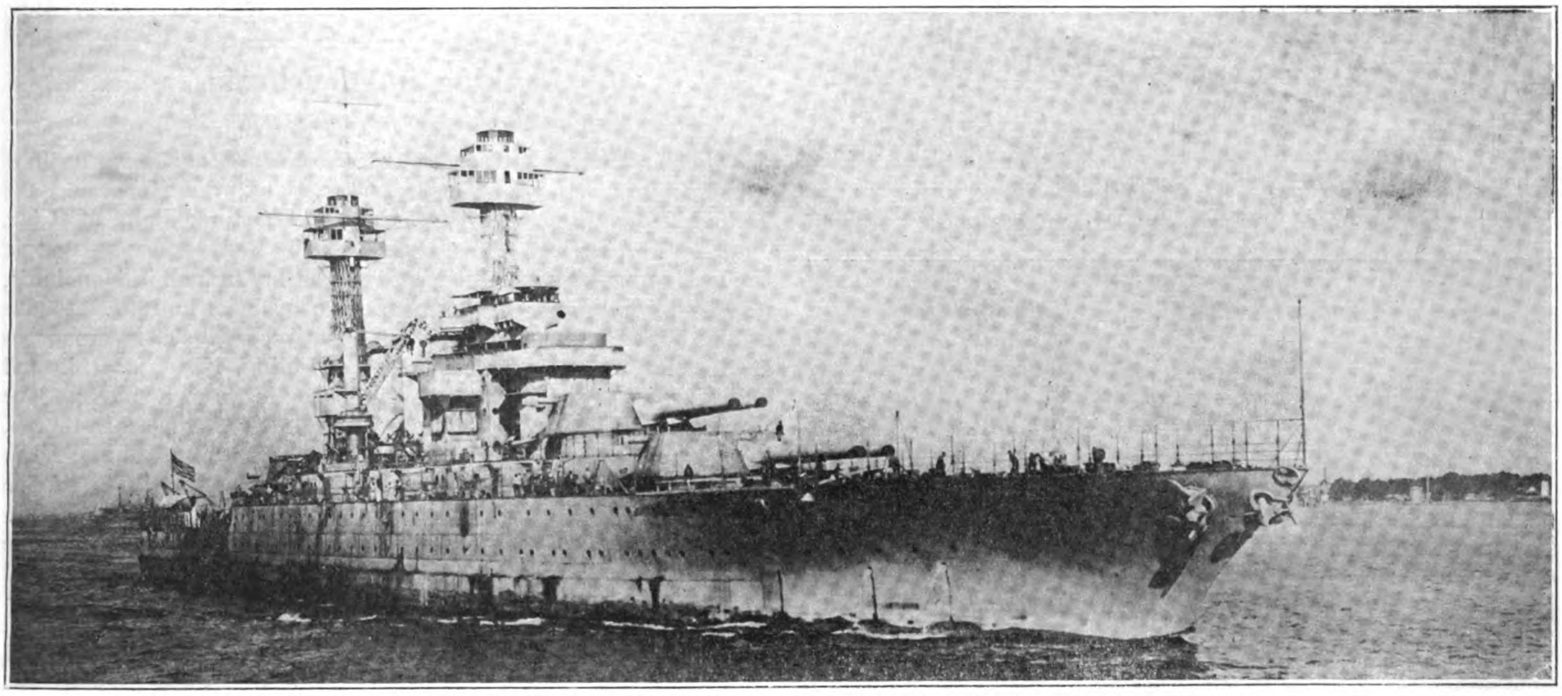
Electricity and the American Navy

THE superdreadnought, the U.S.S. *Maryland,* is in every respect the latest completed achievement of American naval architects. Carrying eight 16-inch guns, the largest ever mounted in a battleship, she will be the most powerful fighting vessel in the world. These mammoth guns, located in four turrets of two guns each, fire a shell weighing 2,100 pounds for a distance of more than 20 miles. These guns are about 57-ft. in length and for each full charge approximately 480 pounds of powder are required.

The secondary battery, consisting of fourteen 5-inch guns, is carried for use against torpedo-boats, submarines and other smaller craft. The ship has also four 3-inch anti-aircraft guns, a 3-inch landing gun, six ·30 caliber machine guns and two under-water 21-inch torpedo tubes for firing the largest and longest range torpedoes.

Captain Charles F. Preston, who has been assigned to the command of the *Maryland* and was aboard during the preliminary trials, is most enthusiastic over the perfect performance of the new electric ship. "Never on a warship that pleased me more in my 36 years with the navy. She's a wonder in every respect, the best warship in our navy and the most powerful in the world" he declared, "I am highly pleased and satisfied with her electric equipment. There is practically no vibration and sometimes I actually looked out to sea to learn if we were under power so quietly and smoothly did her machinery operate."

Like her prototype, the *New Mexico,* pioneer electric warship of the world, the *Maryland* is electrical throughout. Her main propulsion machinery consists of two Curtis steam turbine generators, each designed to develop 11,000 kilowatts at a speed of 2,030 revolutions per minute to drive the ship 21 knots. These supply power to four 7,000 horse-power General Electric induction motors, directly connected with the four propellers and turning at 170 revolutions per minute. The motors, among the largest ever built, are 12-ft. in diameter, weigh 62 tons, and the 28,000 horse-power thus available for propulsion purposes is enough to supply power to a city of 100,000 population.



The U. S. S. "Maryland," 32,600 Tons, the latest American Fighting Ship. Electrically driven

The *Maryland* possesses all the latest provisions for protection against torpedo attacks. It is claimed by naval architects that it will be almost an impossibility to sink the ship by an under-water attack. The crew and vital parts will be protected by armor plate so thick that only the largest caliber shells, fired at moderate range, might penetrate.

Displacing 32,600 tons, this huge warship, electrically driven, will have a speed of 21 knots and a cruising radius of 10,000 miles. She will burn oil, her fuel capacity being approximately 1,392,200 gallons.

The *Maryland* is 624-ft. long and has a beam of 97½-ft. There will be 67 officers in the ship's completement and more than 1,400 men in her regular crew.

This most modern of warcraft recently completed her builders trials with a perfect record. For 33 continuous hours at sea off the Virginia Capes, she was put through all sorts of tests, bringing into play the greatest possible stress on all parts of her machinery and equipment but not the slightest trouble was experienced. In fact naval officials declared she operated more like a boat that had been in service four or five years, so readily and easily did she respond in the tests.

The two turbine generators, supplied with steam generated by eight oil-burning boilers, can be run independently. Either is capable of driving the ship up to a speed of about 17 knots. The power generated by them is used for no other purpose than propelling, electrical current for other needs being generated by six 300-kilowatt turbine generators.

Virtually every electrical appliance used afloat and ashore has been installed in this new battleship. The electrical equipment includes radio telegraph, loud-speaking telephones, ordinary telephones, gyroscope compass, steering gear, anchor windlass, capstan, boat cranes, winches, air compressors, air heaters, turret training, turret gun elevating, ammunition hoists, gun firing, range signalling, powder testing oven, common deck fans, ice machines, laundry equipment, carpenter shop, lighting, visual signals, motion pictures, sterilizer in operating room, potato peeler,

ice-cream freezer and other kitchen utensils, bake ovens, irons for laundry and tailor, storage batteries, motor-boat ignition, etc.

It is probable that no ship built by any nation in the past has been so thoroughly equipped for the comfort and convenience of the crew.

A completely equipped hospital will be maintained on board with navy surgeons to look after the health of the crew and a dentist to look after the men's teeth. A chaplain will be assigned to the ship to hold regular church services and to devote his time to spiritual welfare of the officers and men.

The *Maryland* is third in order of completion of the electrically propelled battleships for the navy. She was built by the Newport News Shipbuilding & Dry Dock Company and the electrical equipment was designed and manufactured by the General Electric Company.

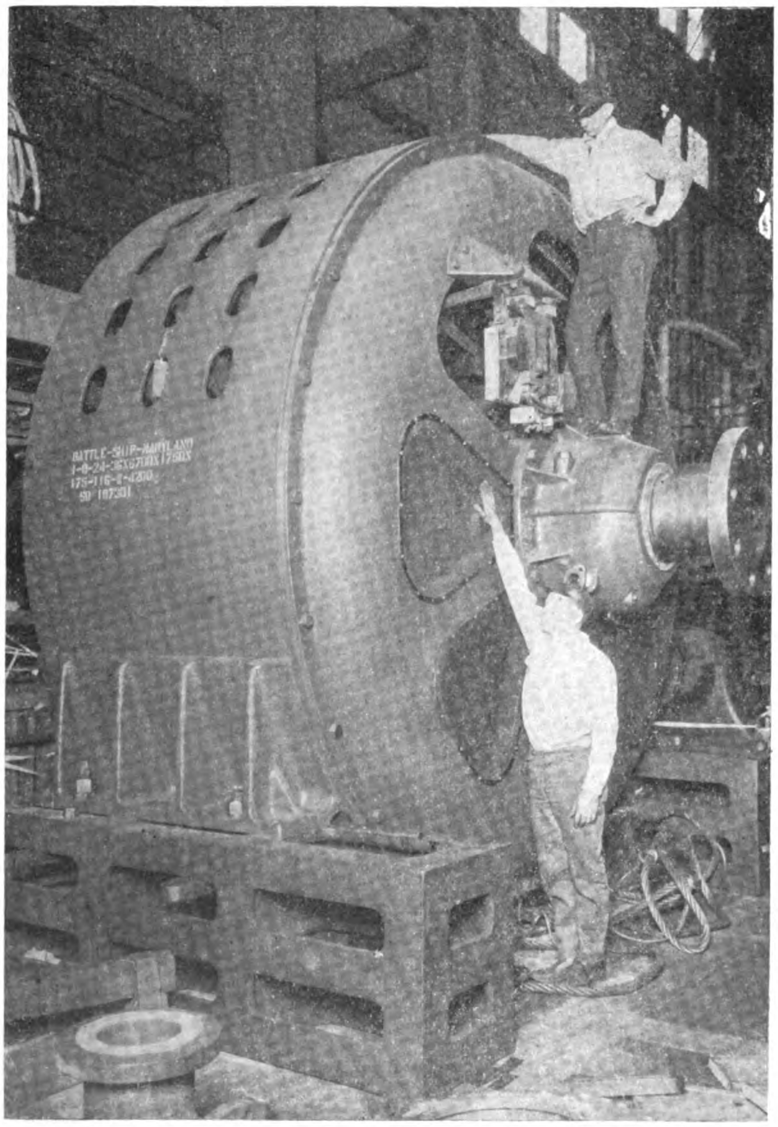
The ship was launched on March 20, 1920. Her chief characteristics are :

Length	624 feet
Beam	97 1/2 feet
Draft	30½ feet
Weight	32,000 tons
Speed	21 knots
Number of propellers	4
Shaft horse-power	30,000
Oil capacity	1,400,000 gallons
Oil-burning boilers	8

Four more battleships of this type are being built, the *California* to be completed this summer ; the *West Virginia* to be ready for her trial trips in 1922, the *Colorado* and the *Washington.* In addition the navy is building six 43,000-ton, 60,000 horse-power battleships and six battle cruisers, rated at 180,000horse-power each or six times as powerful as the *Maryland.* Both of these type of warships will carry 16-inch guns and will be electrically driven.

Production of the electrical machinery for several of these vessels is now progressing under the direction of W. L. R. Emmet, consulting engineer of the General Electric Company, who advocated the principles of the electric drive as long ago as 1909, was instrumental in its adoption by the government, and designed the first electric drive installed by the navy on a battleship, now working so successfully on the U.S.S. *New Mexico.*

Capt. Charles F. Preston of the U. S. S. "Maryland"



One of the Propeller Motors of the U. S. S. "Maryland"

Banking in Manchuria

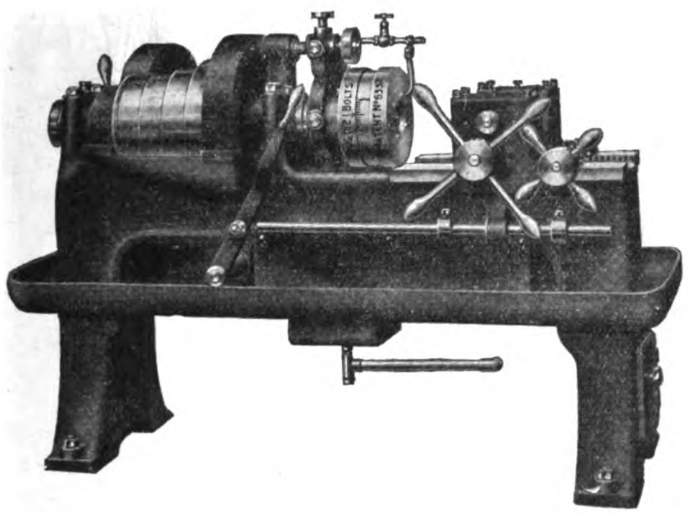
(*Continued from page 258*)

Foreign Banks.—Three are three foreign banks doing business in Manchuria, viz., the Russo-Asiatic Bank, the Hongkong and Shanghai Banking Corporation, and the Chartered Bank of China, India and Australia. The Russo-Asiatic Bank was the first of the foreign banking institutions to establish a branch in Manchuria, its Newchwang office having opened to business in 1897. It now retains but a shadow of its former prosperity, yet it still has branches at Newchwang, Dairen, Changchun, Tiehling, Kirin, Harbin and Tsitsihar, and exercises no small influence in its own sphere. The Hongkong and Shanghai Banking Corporation has agencies in Dairen, Newchwang and Harbin, and the Chartered Bank of China, India and Australia only in Newchwang. These English banks confine their business chiefly to operations in exchange and, though important, their influence does not appear to be so great as in more southern provinces of China. Besides, there are two Russian local banks both having their offices only in Harbin and called the First Loan Bank and the Second Loan Bank. They were established in 1908 and 1910, and have capital of 3,090,000 and 1,080,000 roubles respectively.

Latest Banking Development.—The semi-annual report of the Bank of Chosen ending December 31, 1919, has the following :—

" To describe the recent banking conditions in Manchuria, there are in Manchuria at present 75 banking offices, inclusive of both head and branch offices, managed by Japanese (including 18 of our offices). At the end of November, 1919, the deposits on gold account with these banking offices stood at Y. 91,000,000 and advances, also in gold, at Y. 168,000,000. A comparison of these figures with those of a year ago will show that the deposits have increased by 50 per cent. and advances by 90 per cent. On the same date the balance in silver with them showed Y. 9,900,000 of deposits and Y. 78,600,000 of advances. On the other hand, clearings by the Mukden clearing house (where gold only is handled) ranged between Y. 7,000,000 and Y. 8,000,000 per month, while that by Dairen clearing house reached Y. 200,000,000 on gold account and over Y. 30,000,000 on that in silver. Thus the Dairen clearing house now occupies a place second only to those in Tokyo, Osaka, Kobe and Yokohama. The great demand for funds in Manchuria will be evident from this fact alone. The establishment of new local banks and the extension of existing ones taking place in Manchuria in recent years, is but a natural sequence of this demand, and we doubt not that the healthy development of these institutions will greatly contribute to the economic welfare of Manchuria."

Heap's Patent Screwing Machines



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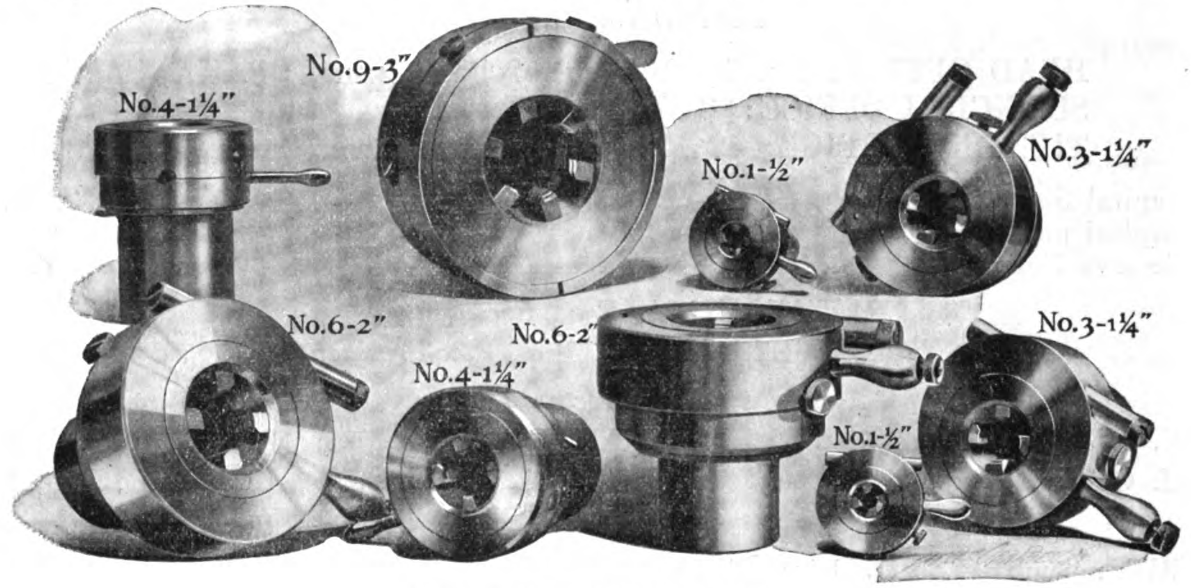

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Capital paid-up	Yen 20,250,000.00
Reserve Funds	Yen 26,825,000.00

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ATUSHI YAMADA, Esq., *Vice-President*

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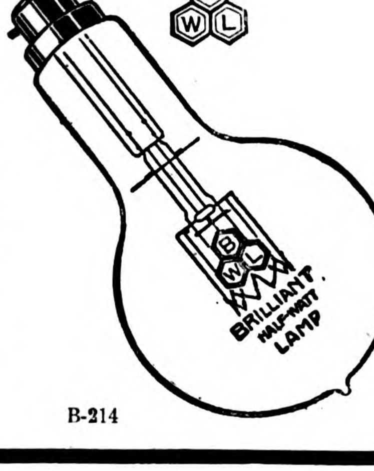

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S. Yoshida, Esq. S. Kakei, Esq.

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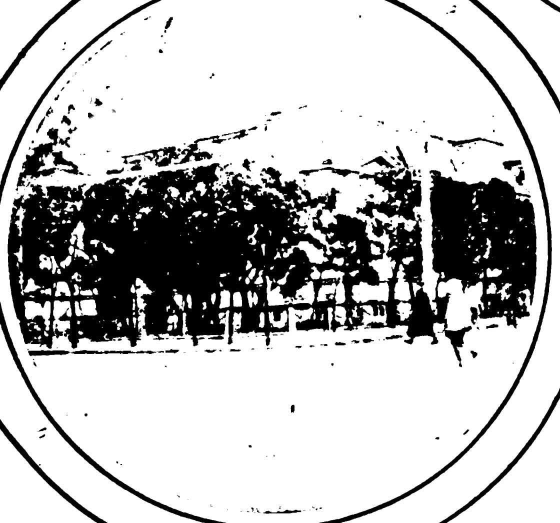

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INCORPORATED BY SPECIAL IMPERIAL CHARTER, 1899

Capital Subscribed - - - - - - -	Yen 60,000,000
Capital Paid-up - - - - - - -	,, 45,000,000
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Deposits ... ... „ 369,000,000

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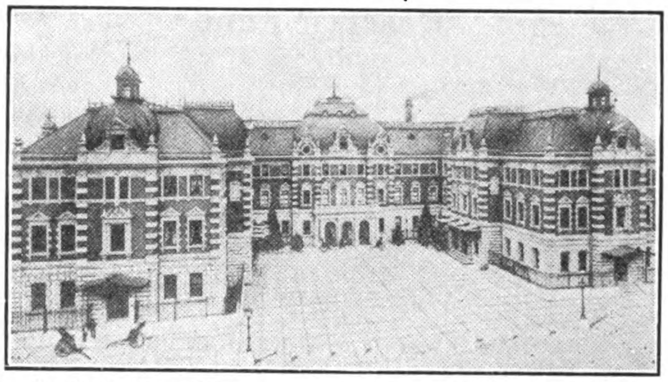

Capital Subscribed.................Y. 100,000,000.00
Capital Paid-Up....................Y. 60,000,000.00
Reserve Fund (July 1921)......Y. 28,000,000.00

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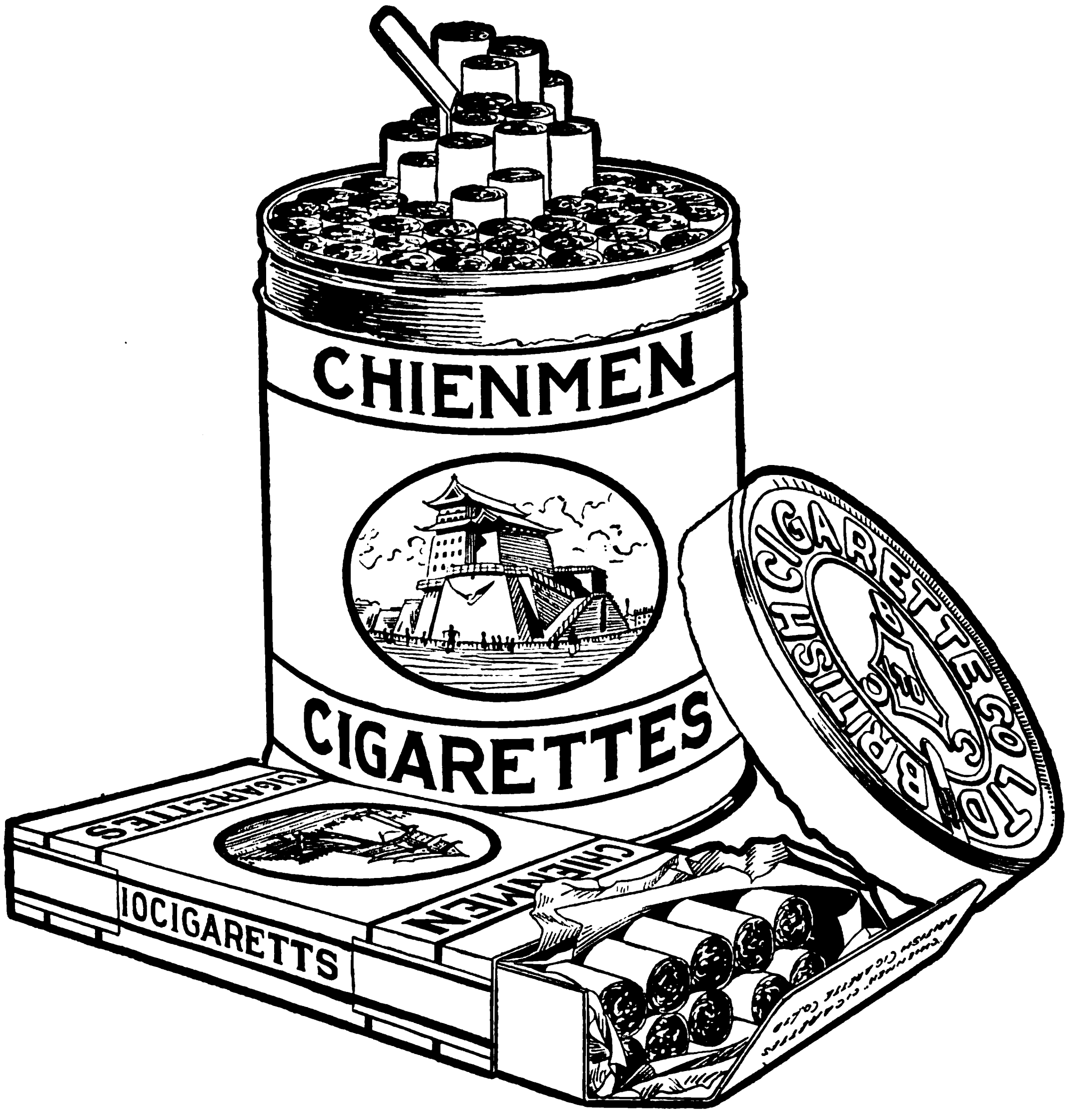

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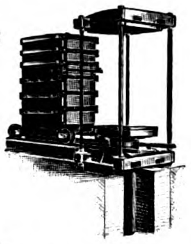

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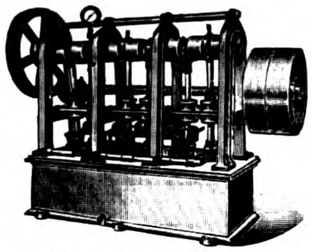

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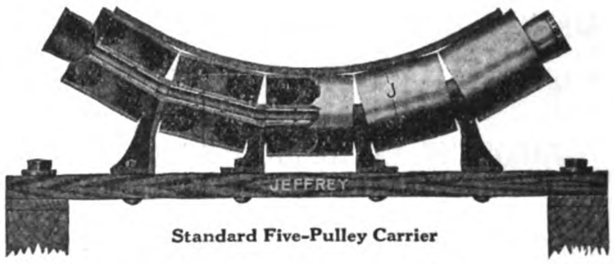

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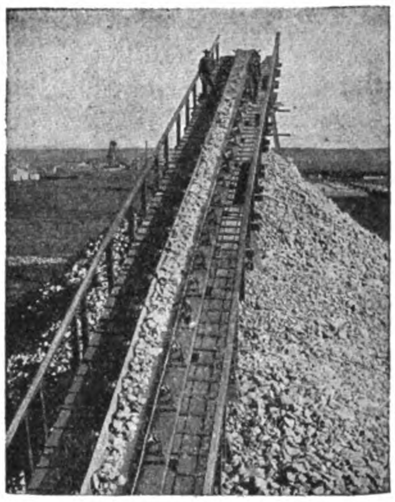

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For pictorial guide-books, pamphlets, and further particulars, apply to the Tourist and Ticket Agencies, or direct to the

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Peking-Mukden Railway
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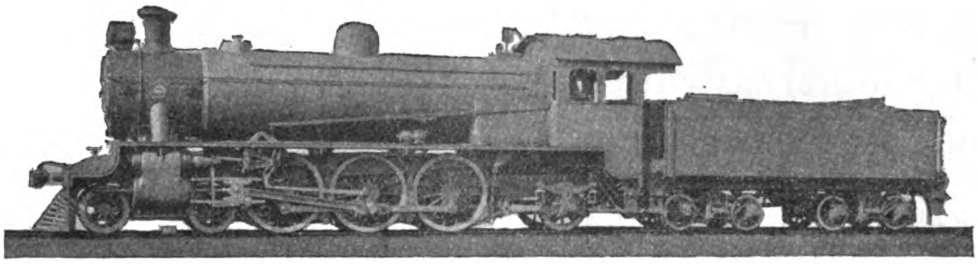

Gauge, 4′ 8½″. Cylinders, 20″ by 26″. Working pressure, 180 pounds. Fuel, Coal. Driving wheels, diameter, 66″. Weight, engine, 175,200 pounds. Total weight, engine and tender, 296,000 pounds. Service, Passenger

IN the early part of 1920, five Baldwin Pacifics were placed in service on the Peking-Mukden Railway—one of China's most important lines. They proved so successful in operation that five additional locomotives of the same type were ordered from us in 1921.

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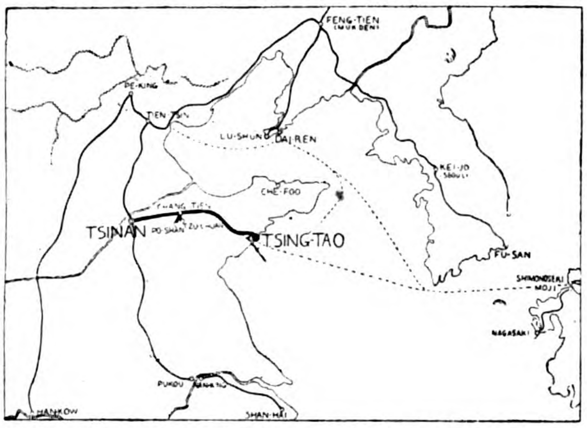


THROUGH TRAFFIC

Through passenger tickets are issued between the following principal stations of the Shantung Railway: Kiaochow, Kaomi, Fangtsu, Weihsien, Chingchow, Changtien, Choustun, Tsinan, Tzuchuan, Poshan, and the following points: In Manchuria—Port Arthur, Newchwang, Liaoyang, Fushun, Mukden, Tiehling, Kaiyuan, Changchun, Penchihu, Antung, and Dairen; in Japan—Tokyo, Yokohama, Nagoya, Kyoto, Osaka, Kobe, Ujina, Moji, Shimonoseki, Nagasaki and Shanghai.

Steamer Connections—Steamers leave the wharves of the Large Harbour, Tsingtao, for Moji and Kobe every five days, for Shanghai about twice a week and for Dairen about three times a week.

For giving facilities to through passengers for Japan, a special train in connection with the night train No. 4 is operated from the Harbour Station to the Wharf, direct alongside the ship, on those days when the liners of the Nippon Yusen Kaisha, Osaka Shosen Kaisha, and Harada S.S. Co. are leaving.

Through passengers and their luggage are carried free of charge for this section.

Collieries—The Tzuchuan (Shisen) and Fangtzu (Boshi) Collieries are managed by the Mining Department of the Shantung Railway.

At present the daily output of Tzuchuan coal is about 1,500 tons, far surpassing the amount taken out when the Germans were in control. The coal is well-known for its good quality and fair price.

Tsinan—Tsinan, the capital of Shantung, is the western terminus of the Shantung Railway, and also one of the most important stations on the Tientsin-Pukow Railway.

The Tsinan Railway Hotel, furnished in modern European style, is found on the upper floor of the Tsinan Station, under the control of the Shantung Railway Administration.

THROUGH TRAIN SERVICE

Train No. 1 leaves Tsingtao daily 10.00 p.m. arrives Tsinan 8.00 a.m.
Train No. 3 leaves Tsingtao daily 8.00 a.m. arrives Tsinan 6.40 p.m.
Train No. 2 leaves Tsinan daily 11.00 p.m. arrives Tsingtao 8.35 a.m.
Train No. 4 leaves Tsinan daily 10.10 a.m. arrives Tsingtao 8.20 p.m.

Local Trains run between Tsingtao and Kaomi, Weihsien and between Fangtzu and Tsinan, and on the Poshan and Tzuchuan colliery branches.

Fares—Tsingtao-Tsinan—1st class, $14.30 ; 2nd class, $7.20.

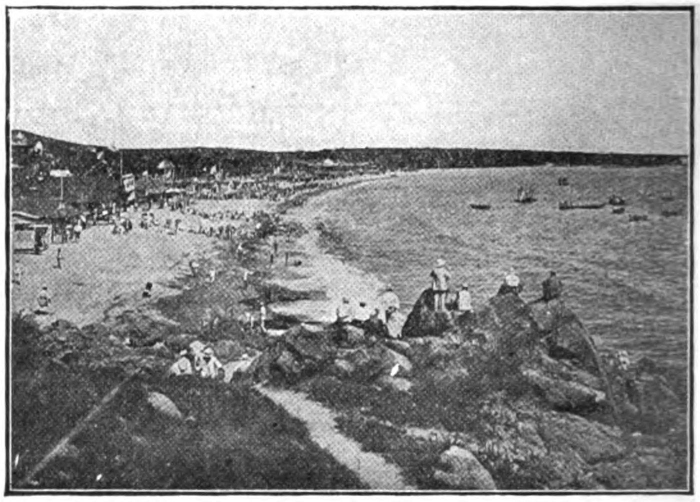
First Class Sleeping Car—A first-class sleeping car is attached to night trains Nos. 3 and 4 running between Tsingtao and Tsinan. For a berth in the sleeping car in S.Y. 3.00 for the lower berth and S.Y. 2.00 for the upper berth is charged in addition to the ordinary first-class fare, irrespective of distance.

Dining Car—A dining car is attached to through trains Nos. 1, 2, 3 and 4 running between Tsingtao and Tsinan. Meals are served to order at any time.

Ticket Agencies—Messrs. Thos. Cook & Son and their branch offices in various parts of the world. The Japan Tourist Bureau in Tokyo and their Agents in Yokohama, Kobe, Nagasaki and Peking.

Connections at Tsingtao—By steamer with Japan, Manchuria and Shanghai.

Connections at Tsinan—By Tientsin-Pukow Line with Tientsin, 6.00 & 9.38 a.m. daily, and with Pukow, 7.44 a.m. & 10.21 p.m. daily.



BATHING BEACH, TSINGTAO.

Description of Tsingtao

Tsingtao is considered the most healthful place in all the Far East. The scenery including both mountains and sea, is most beautiful. There are quite extensive forest gardens, bits of woodland here and there, and many delightful shady lanes affording most interesting walks through them.

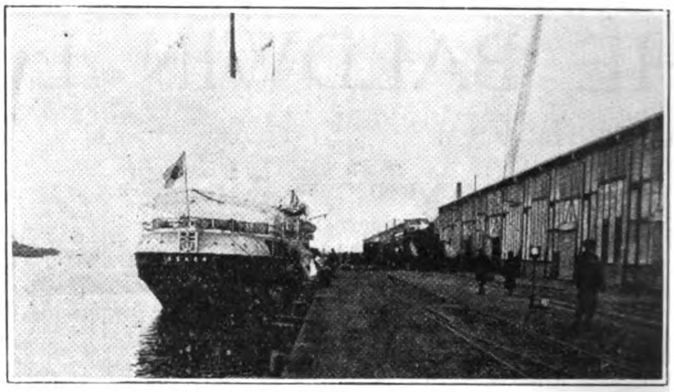
The roads are all broad, with very moderate gradients. They are of both macadamized and asphalt construction for vehicle traffic, while the sidewalks are either paved or concrete. These streets are practically all lined with beautiful shade trees.

The buildings are constructed principally in modern European style, with red tiles and white walls, contrasting pleasantly with the surrounding green mountains and blue sea.

The climate here is fine from Spring to Autumn, being neither too hot nor too cold. These climatic conditions make the place a favourite summer resort for Europeans and Americans from Shanghai, Tientsin, and other places.

The hotels are luxuriously furnished with up-to-date equipment and are under the efficient management of Mr. H. J. Hearne.

The hotel rates are $6.00 and up, per day, on the American plan.



THE GREAT HARBOUR, TSINGTAO

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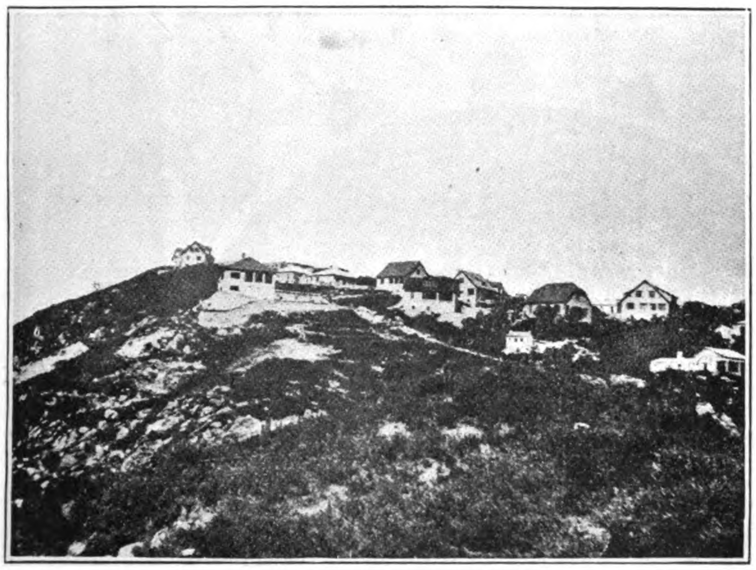
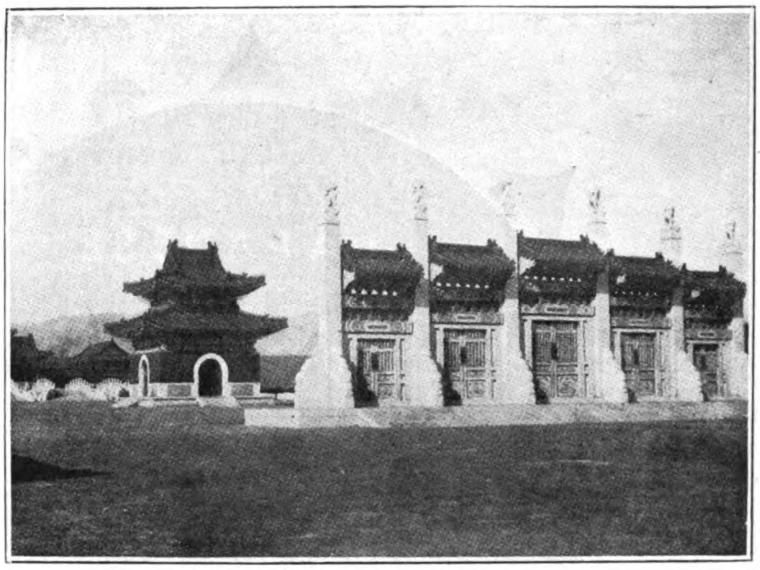


SUMMER RESORT AT CHI KUNG SHAN



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From the Capital to Hankow the journey occupies 34 hours, by the daily through train which is provided with up-to-date sleeping and dining accommodations.

In the future, this line will connect by means of a ferry-boat the Hankow-Canton Railway whose completion will bring the Capital of China, and Hankow, the Great Central Market, within easy distance of Canton the southeastern metropolie.

From the Capital to Hankow the journey about 30 hours by the bi-weekly "Express" through train which is provided with up-to-date sleeping and dining accommodations.

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Hsi-ling or Western Imperial Tombs.—With their present-day accessibility, there is now little excuse for visitors to Peking omitting a trip to the Western Imperial Tombs, undoubtedly one of the most impressive sights in China. The site of these beautifully adorned Imperial Tombs is close to Liang Ko Chwang station, 79 miles from Peking, which is reached by a Branch-line, formerly built for the exclusive use of the Imperial Sovereigns when visiting the Tombs of their ancestors. The Western Tombs include the mausoleums of four Manchu Emperors and three Empresses, as well as those of a number of Princesses. The region, as a well laid-out park, closely wooded, is justly appreciated for the charming scenery surrounding the Imperial Tombs and is highly recommended to any one in search of the extraordinary and beautiful.

For Particulars, Pamphlets, Reservations, Tickets, etc., apply to the "Information Bureau" at Peking Head Office or to Tourist Agencies.

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SOUTH MANCHURIA RAILWAY

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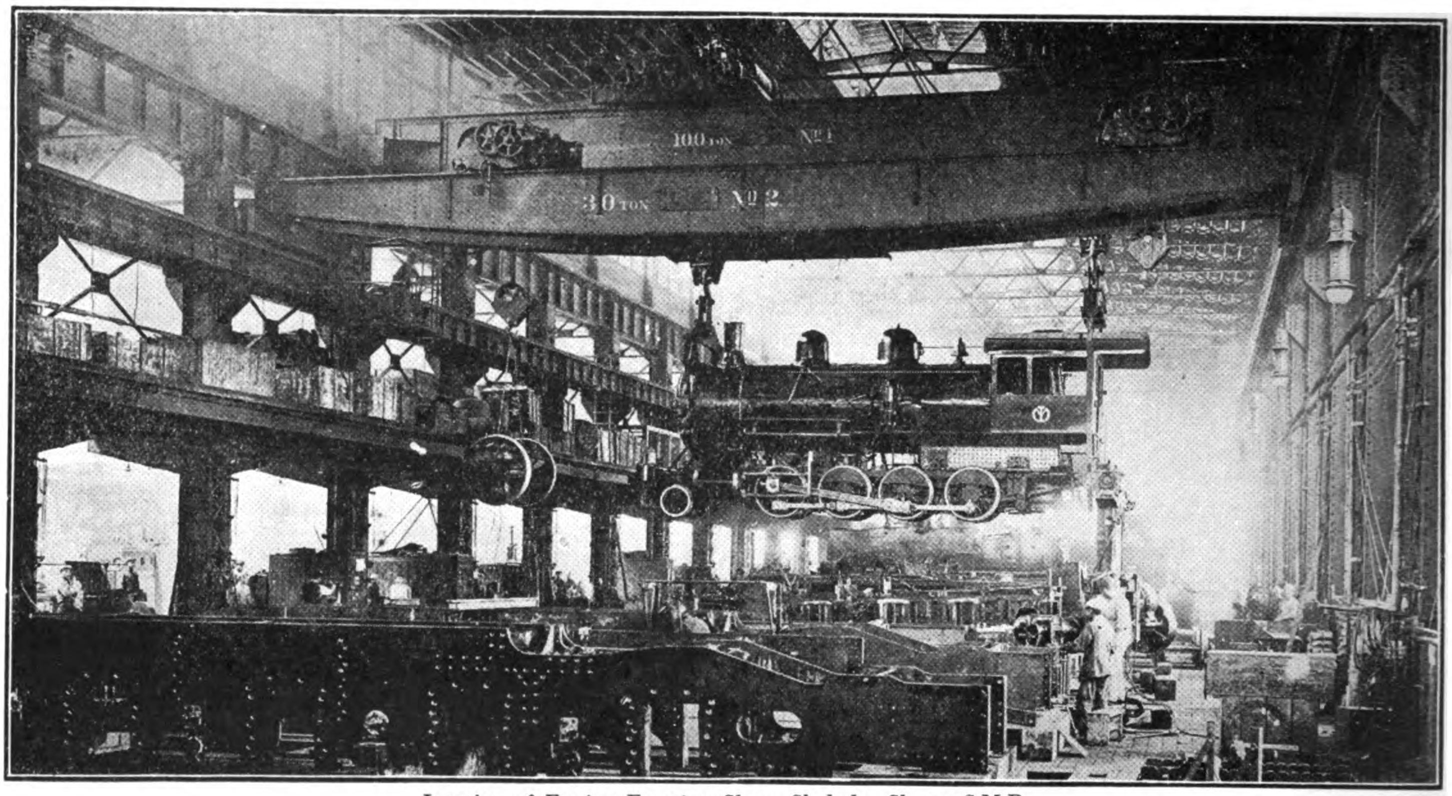

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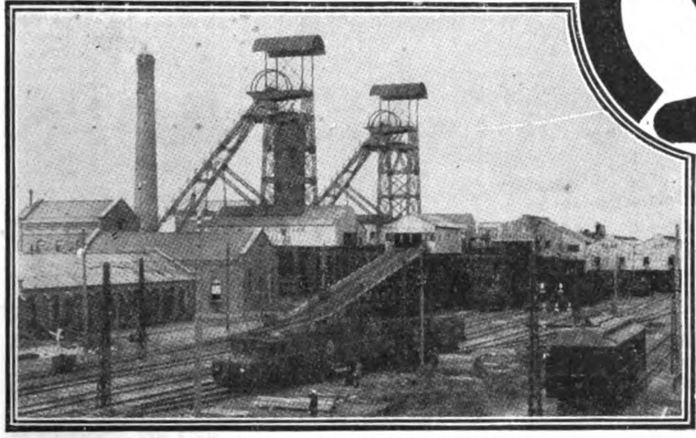
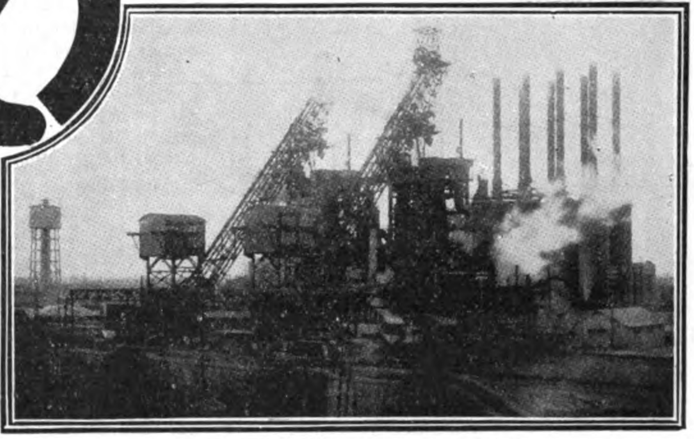


Togo Pit of the S.M.R. Fushun Collieries



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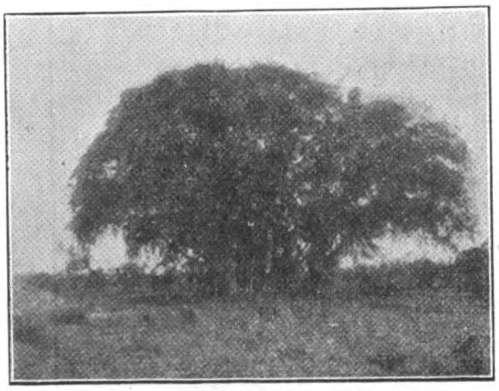
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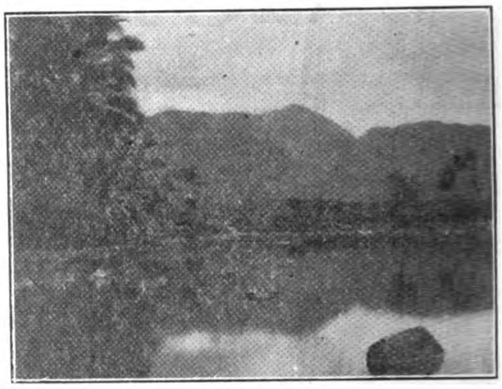
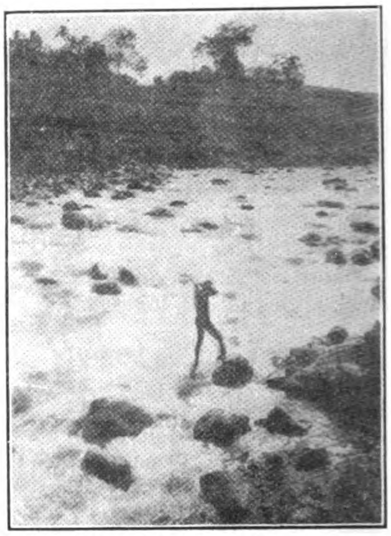
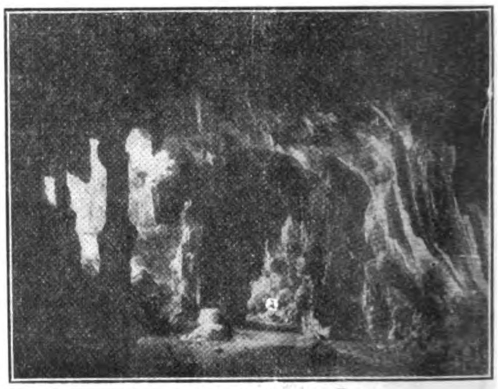

Pond in the Neighborhood of Garoet.


River Brantas, Malang.


Caves, South Coast, Java.

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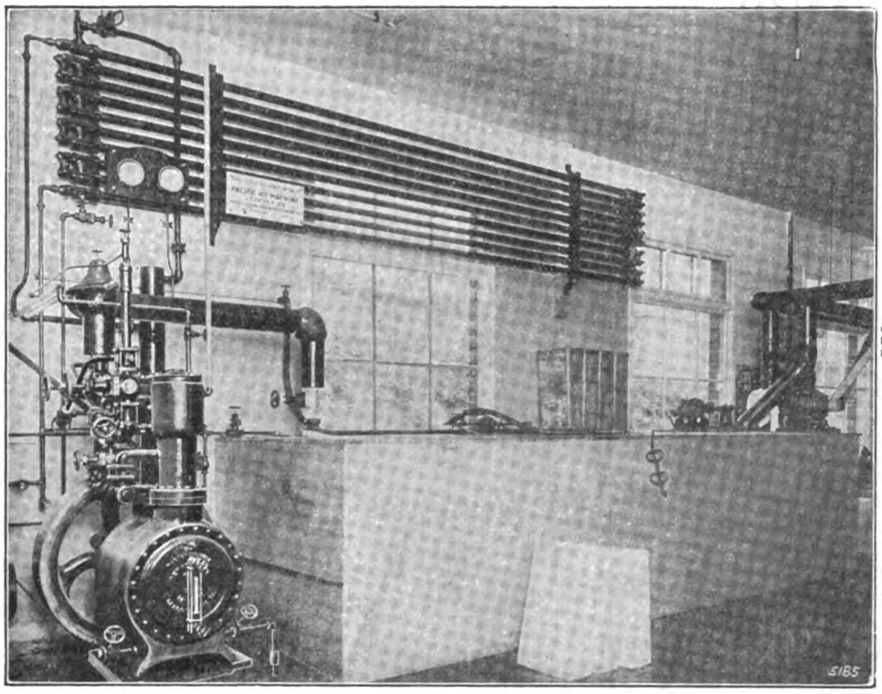

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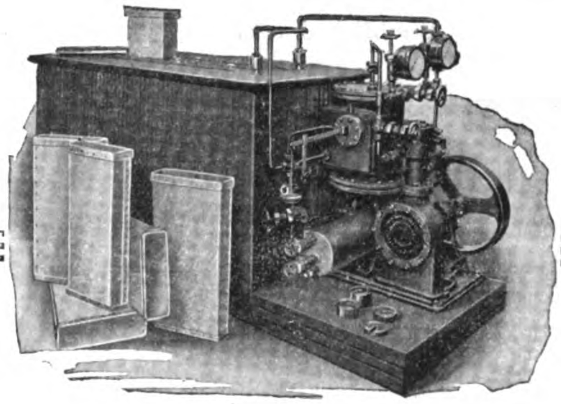

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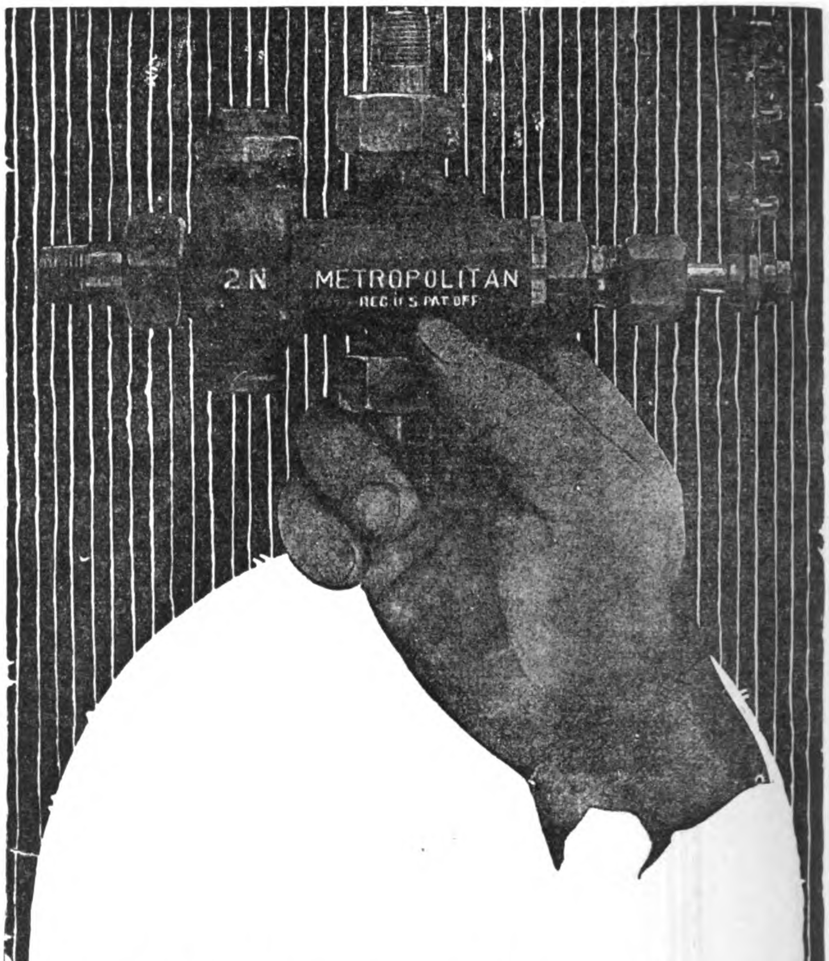

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Is the only Trade Directory of North China issued twice a year. Its information is the most accurate and complete. Published regularly since 1865 it has grown to 900 pages. In addition to the names and addresses of every foreign firm, resident, and missionary in China it contains the following classified information:—

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TRADE DIRECTORY.—A list of all Shanghai firms under their professional or trade headings.

AGENCIES.—Agencies held by Shanghai firms are listed alphabetically, with the firm's name after them.

STREET DIRECTORY.—A list of the streets of Shanghai in English and Chinese, with the occupants of all foreign and many Chinese houses, offices, and stores.

SHANGHAI WHO'S WHO.—An alphabetical list of the men of Shanghai, with their business addresses.

RAILWAYS.—A list of the Northern Railways of China, with their foreign and native staffs, including those resident in Shanghai.

RESIDENTIAL DIRECTORY.—A complete list of the foreign residents of Shanghai, arranged alphabetically, with their private addresses.

OUTPORT HONG LIST.—A list of Northern and Central China cities and outports with foreign firms and institutions and their staffs.

OUTPORT WHO'S WHO.—An alphabetical list of foreign men in Northern and Central China, compiled from the Outport and Railway Sections of this work.

OUTPORT LADIES' LIST.—An alphabetical list of foreign ladies, not engaged in mission work, resident in Northern and Central China.

OUTPORT MISSIONARIES.—Classified alphabetically by provinces. Under the names of the provinces are given the towns where missions are established, with list of residents. This is divided into two sections: (1) Protestants, (2) Roman Catholics. Mission Institutions, such as Schools, Colleges, etc., will be found under the respective Ports in which they are instituted.

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FIG. W2621
IRON BODY GATE VALVE

FIG. W4104

FIG. W1323
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FIG. W3782
IRON COCK

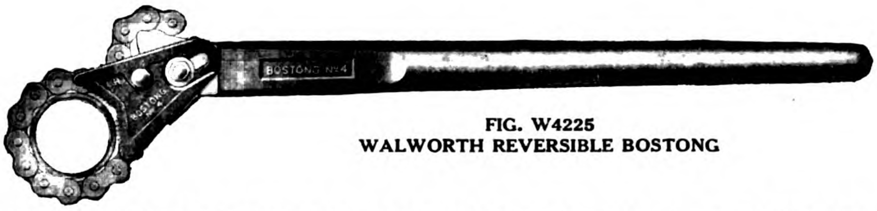

FIG. W4225
WALWORTH REVERSIBLE BOSTONG

FIG. W2351
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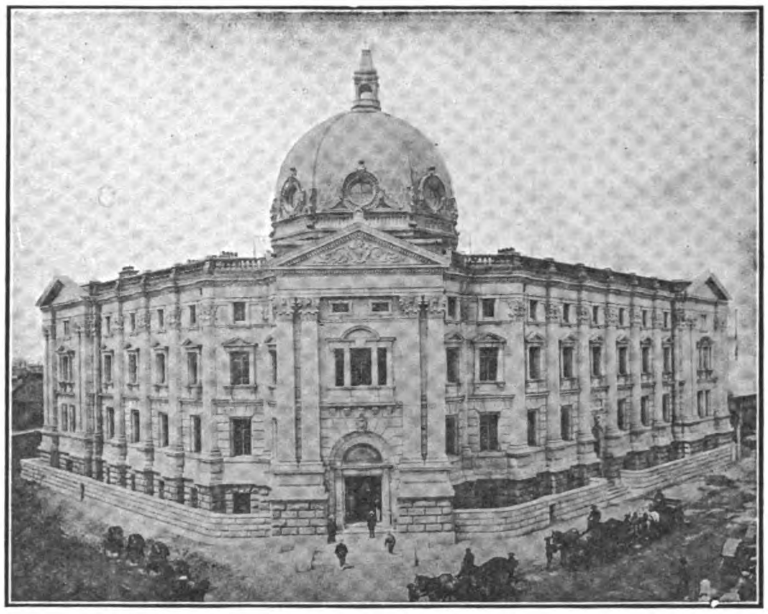

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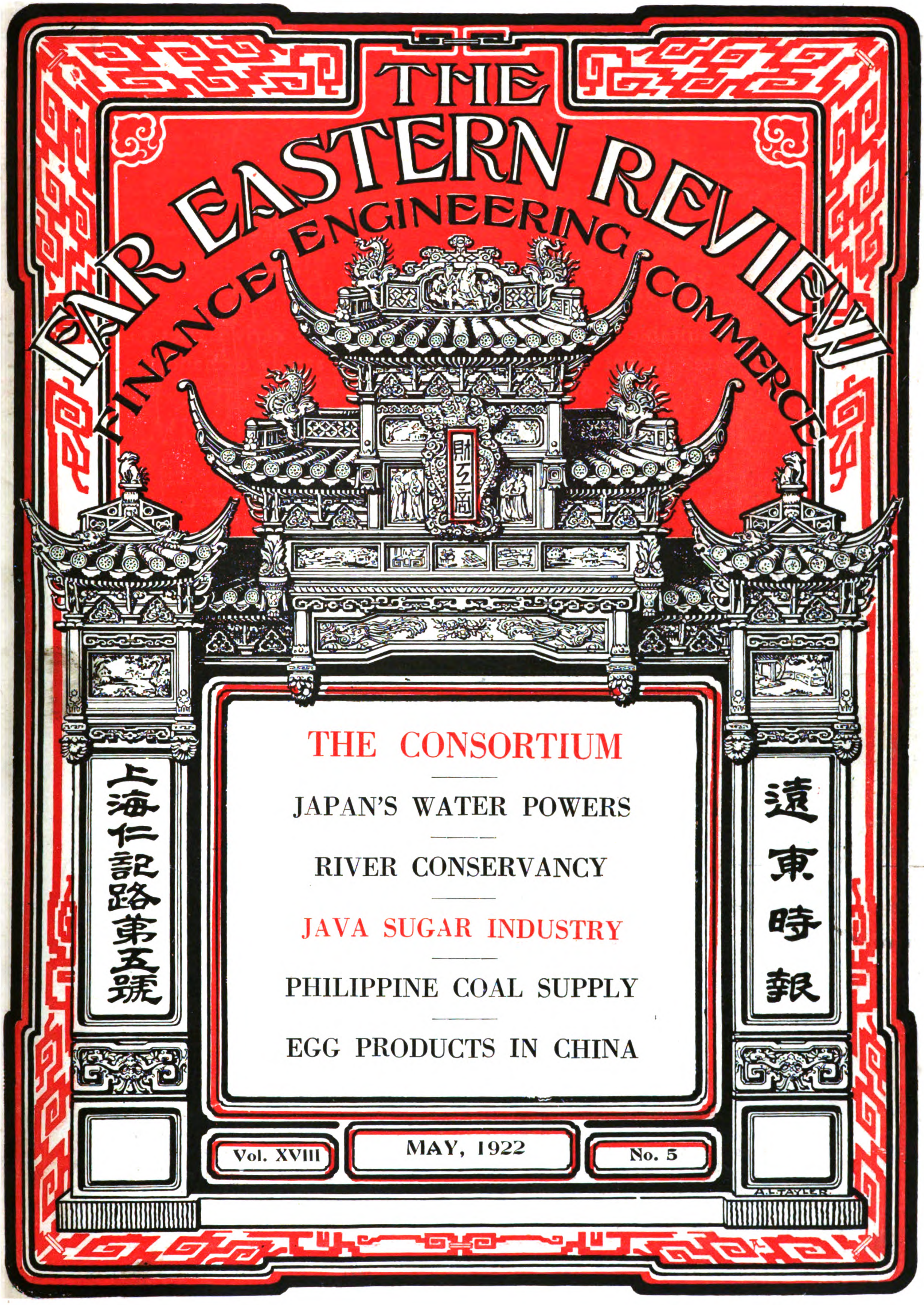

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FIG. W4161. Nos. 0 to 1¾, without Leader Screw

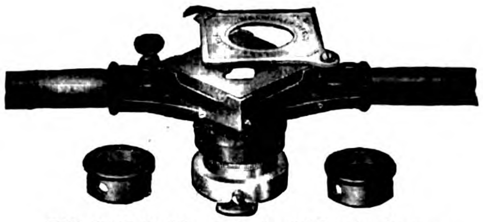

FIG. W4162. Nos. 2, 3, 4, with Leader Screw

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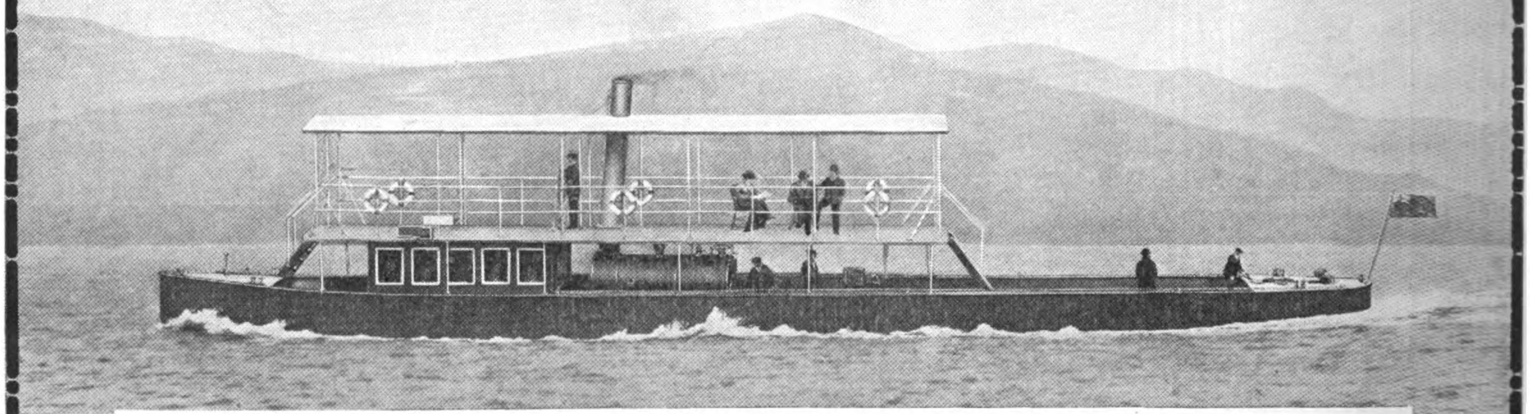

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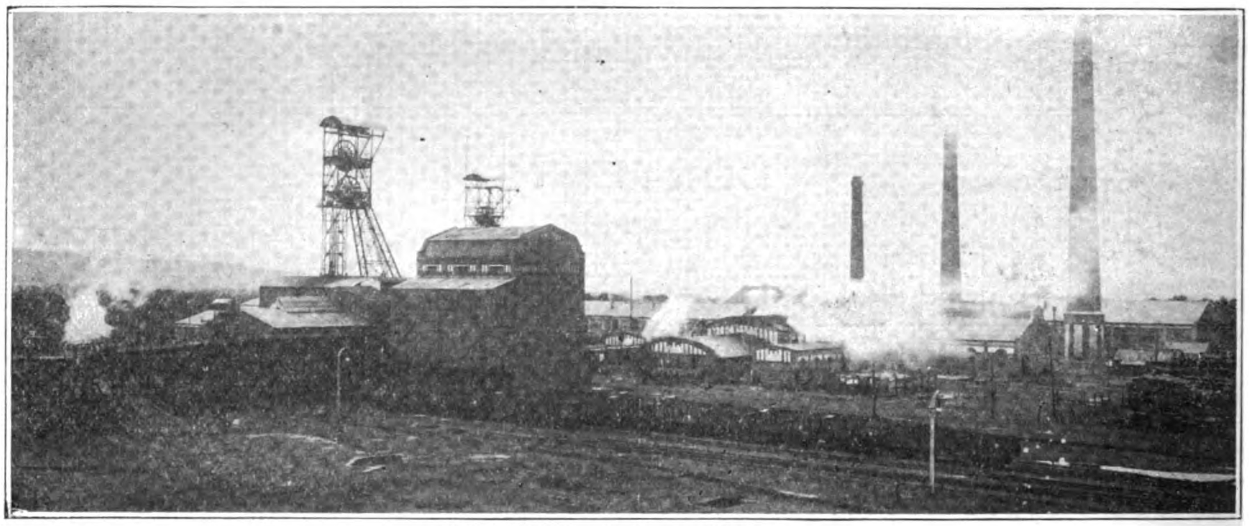

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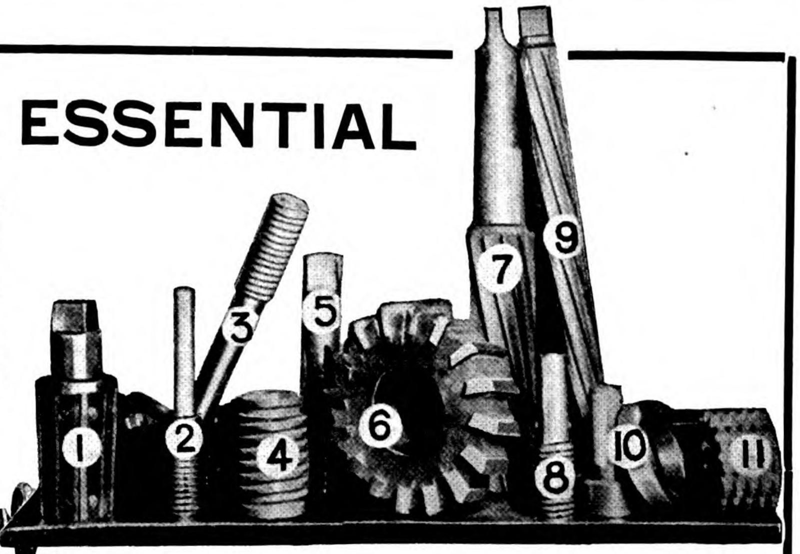

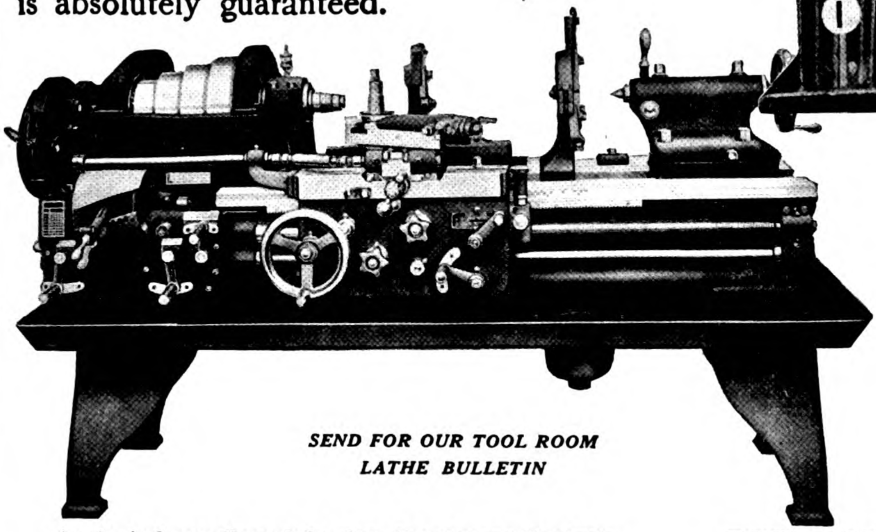

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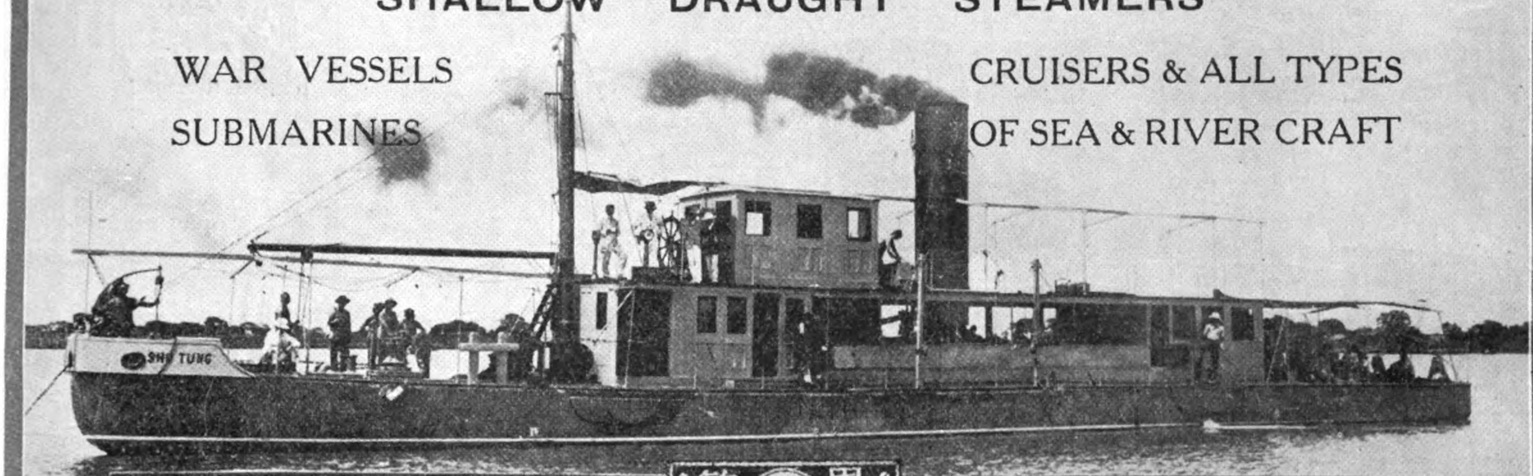

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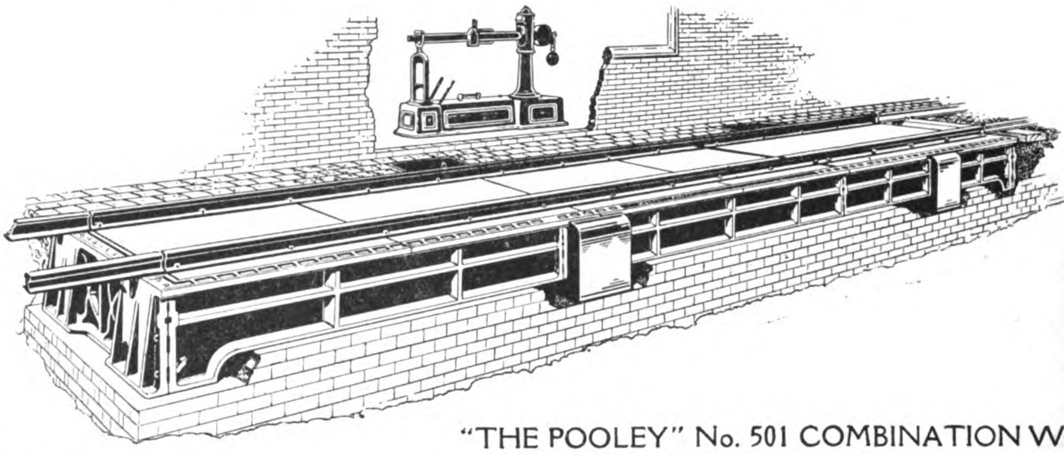

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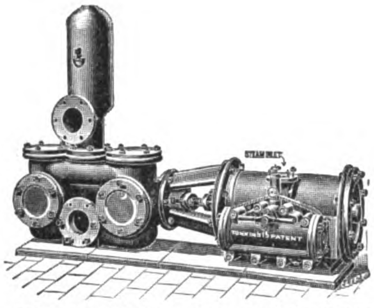

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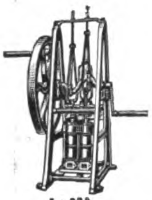
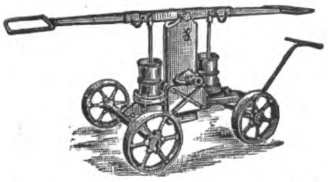
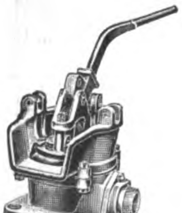
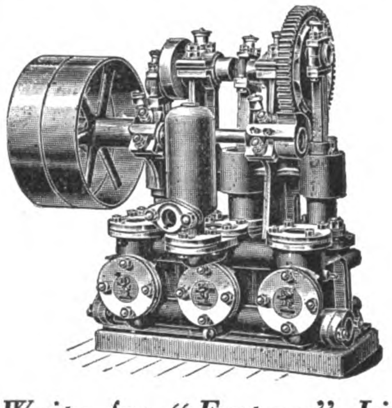


Fig. 228.

Fig. 160.







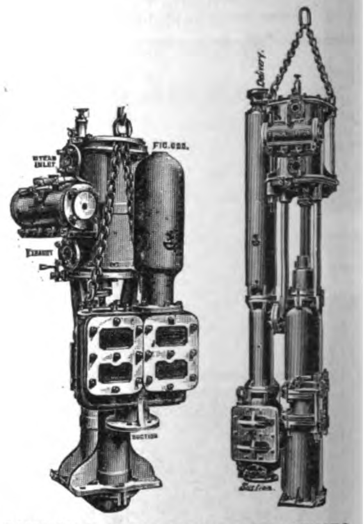


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Fig. 191.

Fig. 185.

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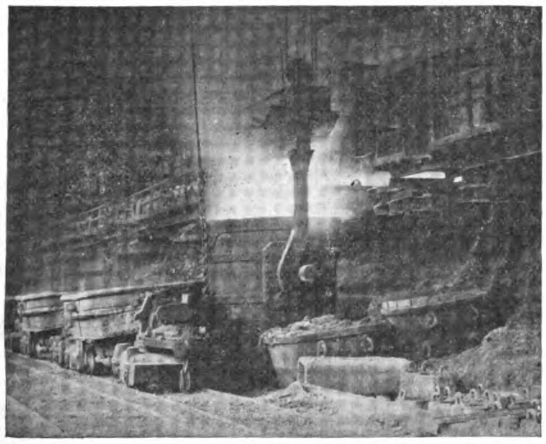

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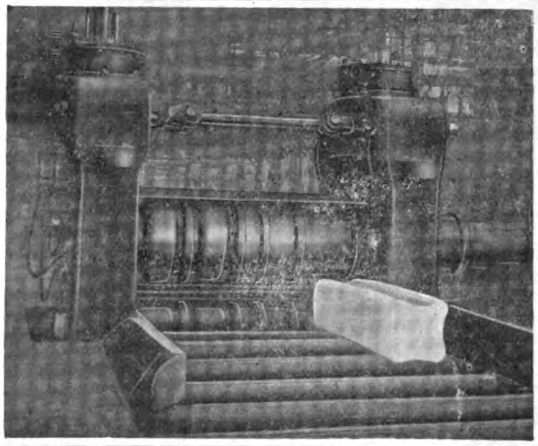

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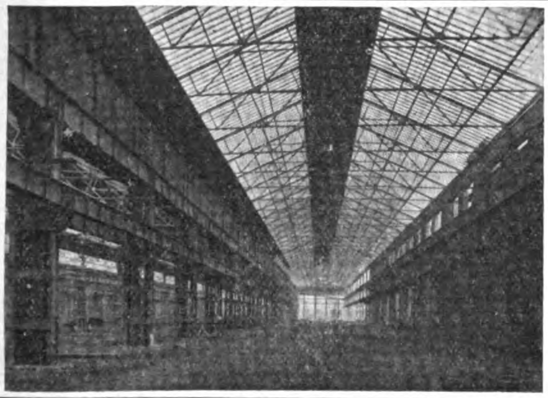

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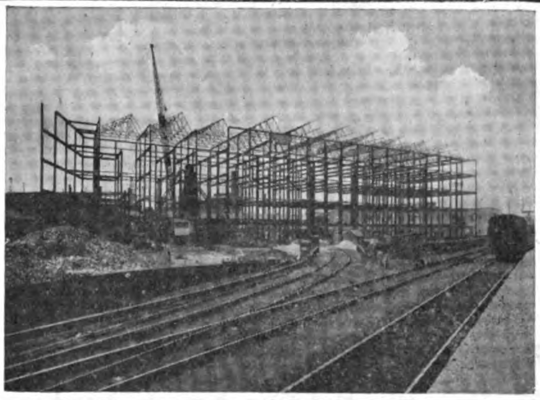

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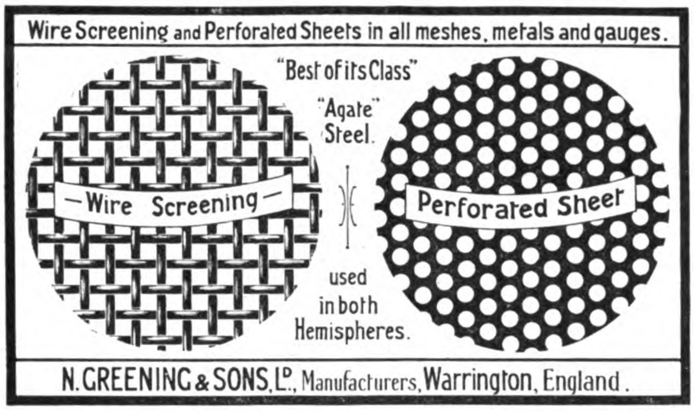

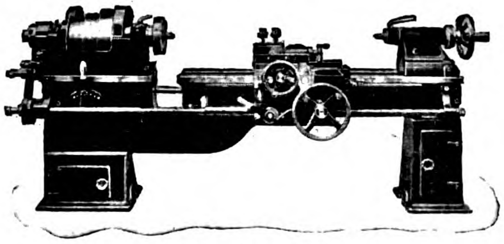

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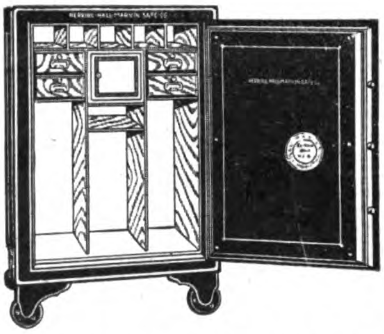

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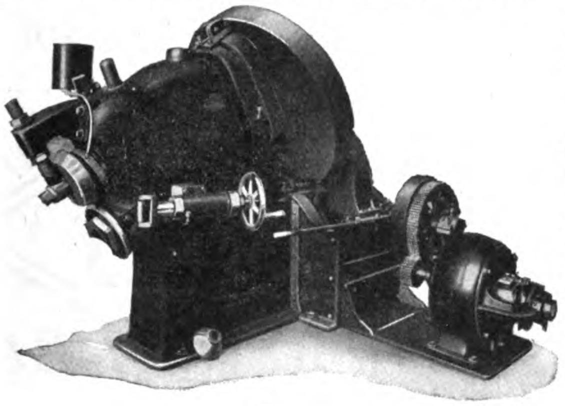

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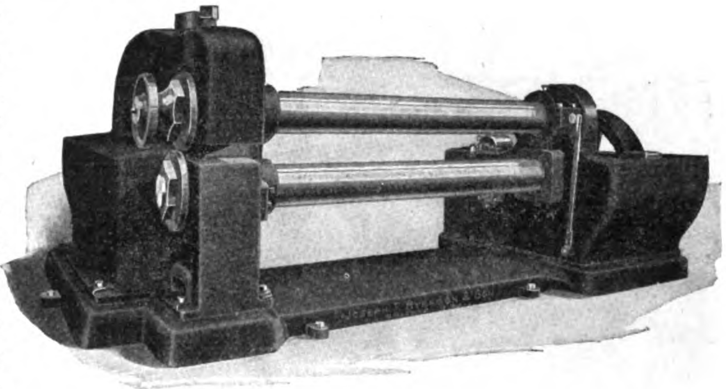

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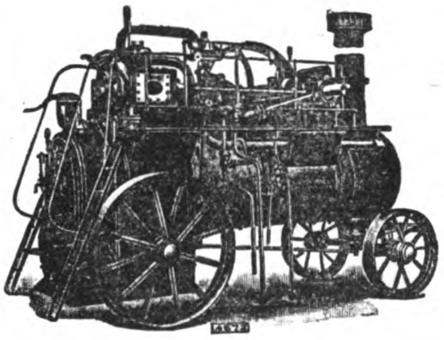

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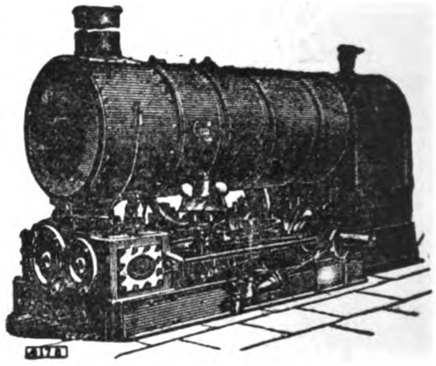

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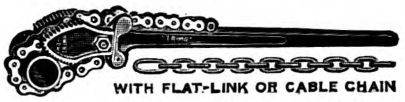

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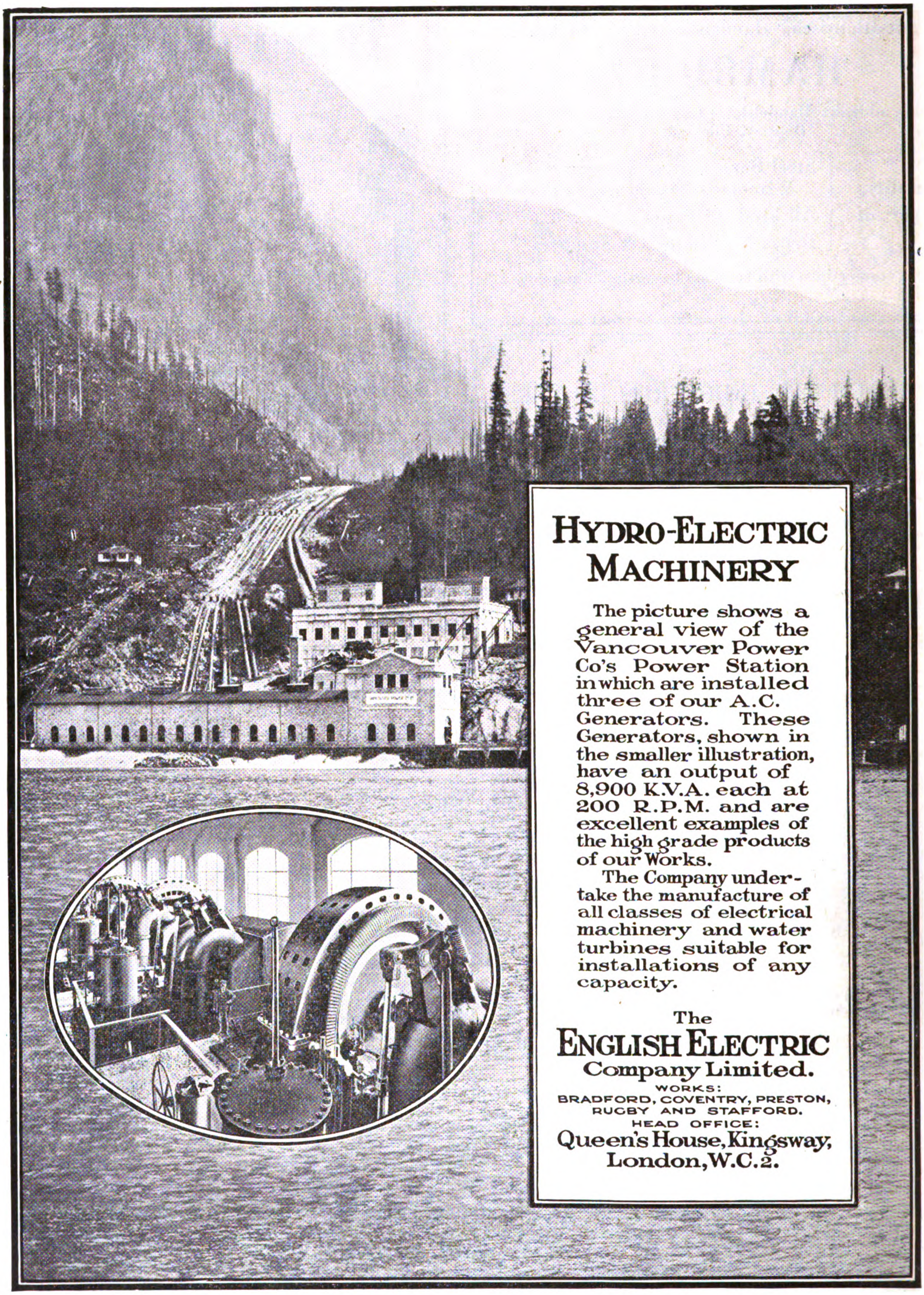

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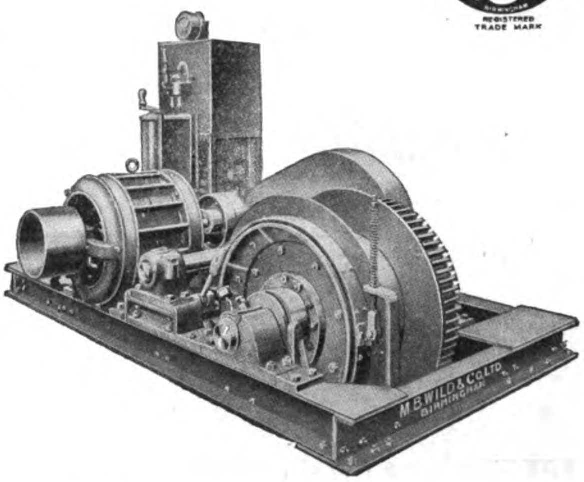

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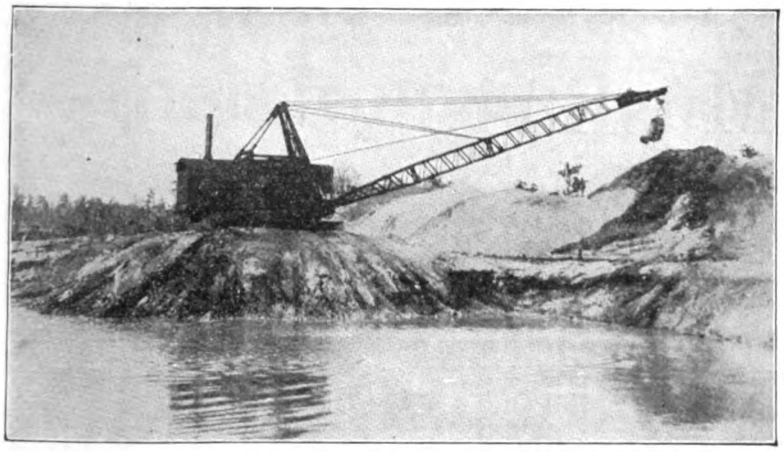

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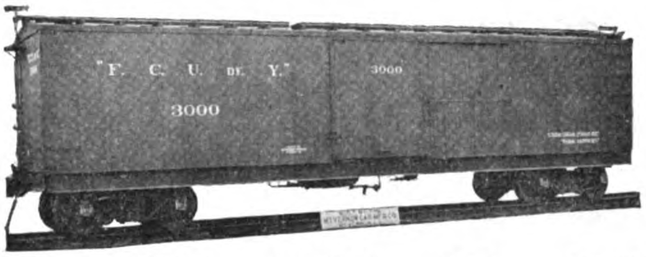

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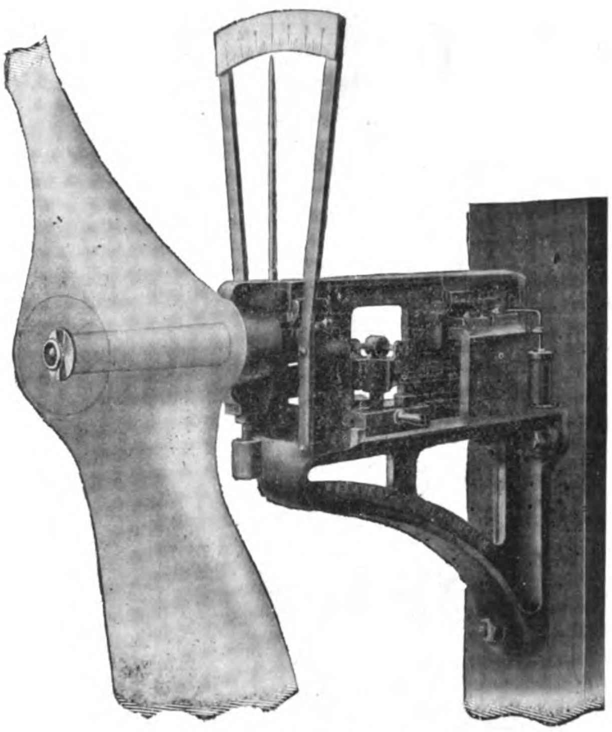

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Ad. 607

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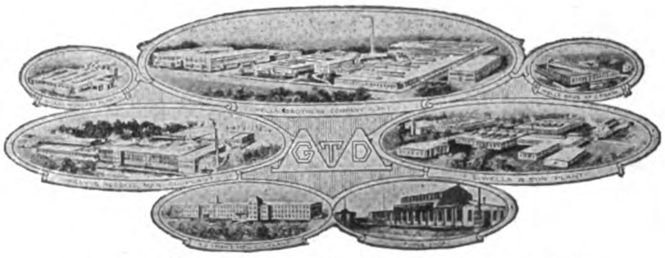

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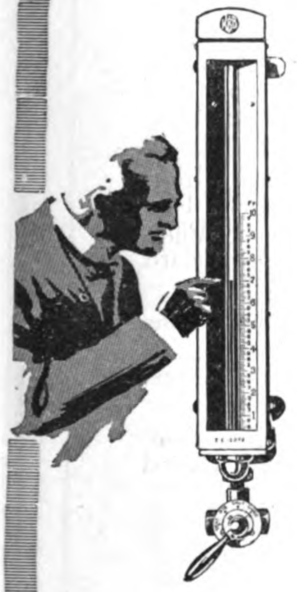

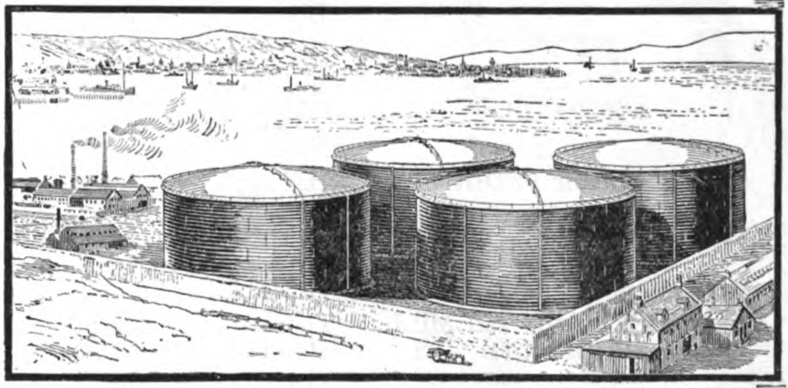

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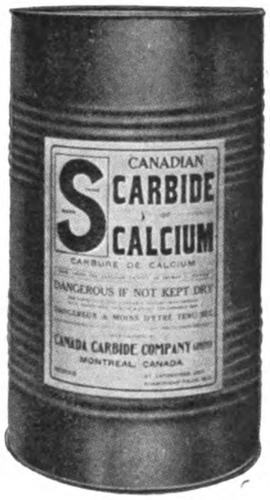

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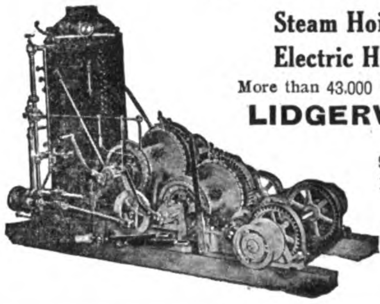

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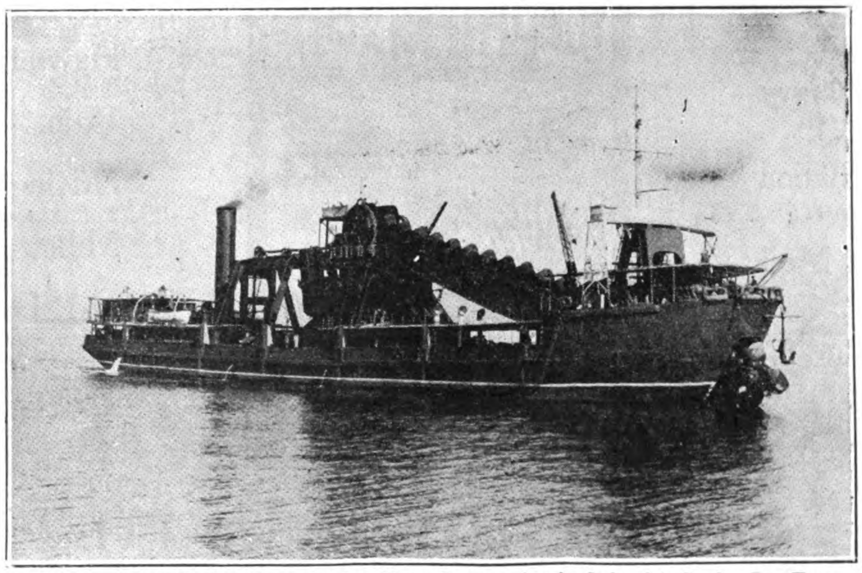

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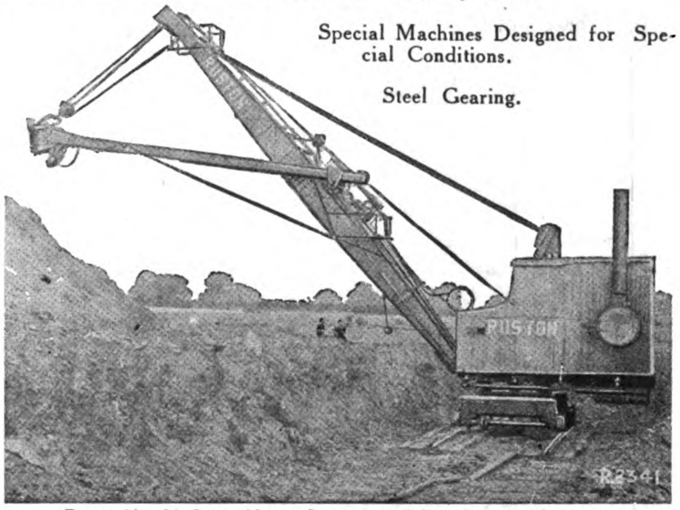

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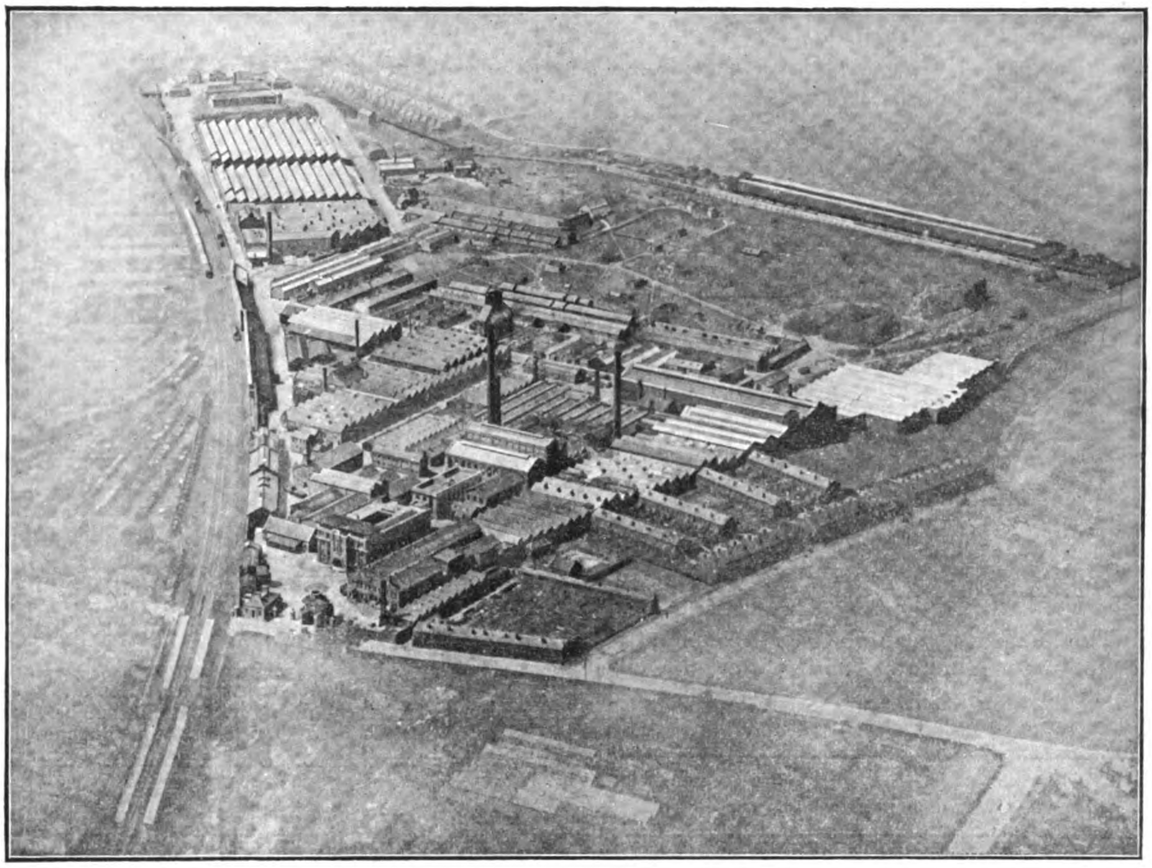

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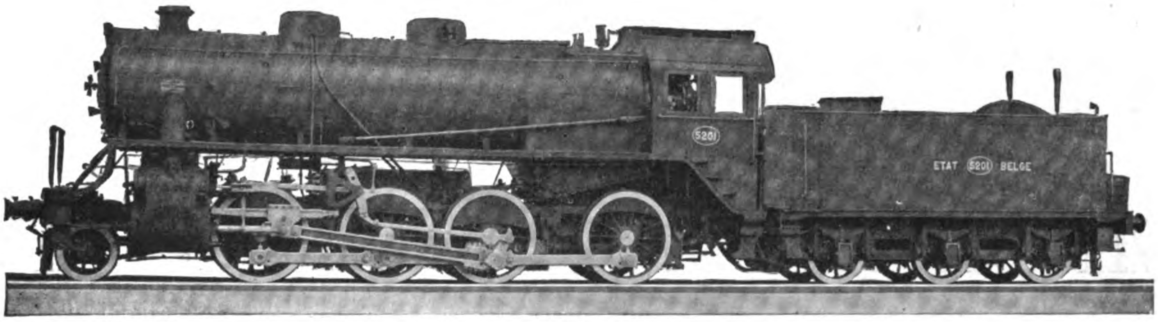

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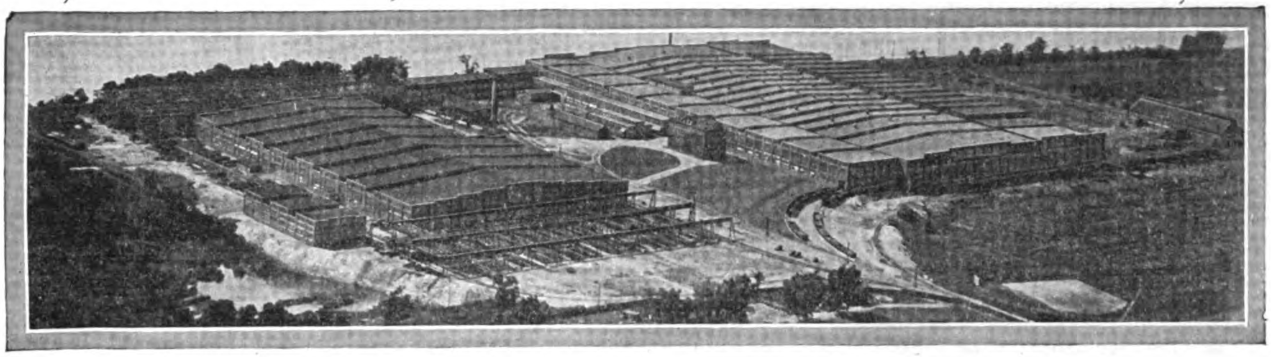

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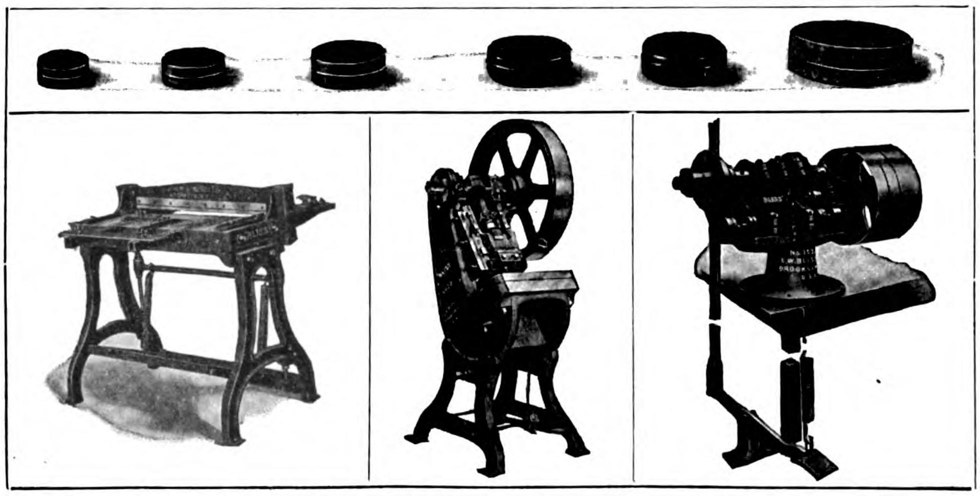

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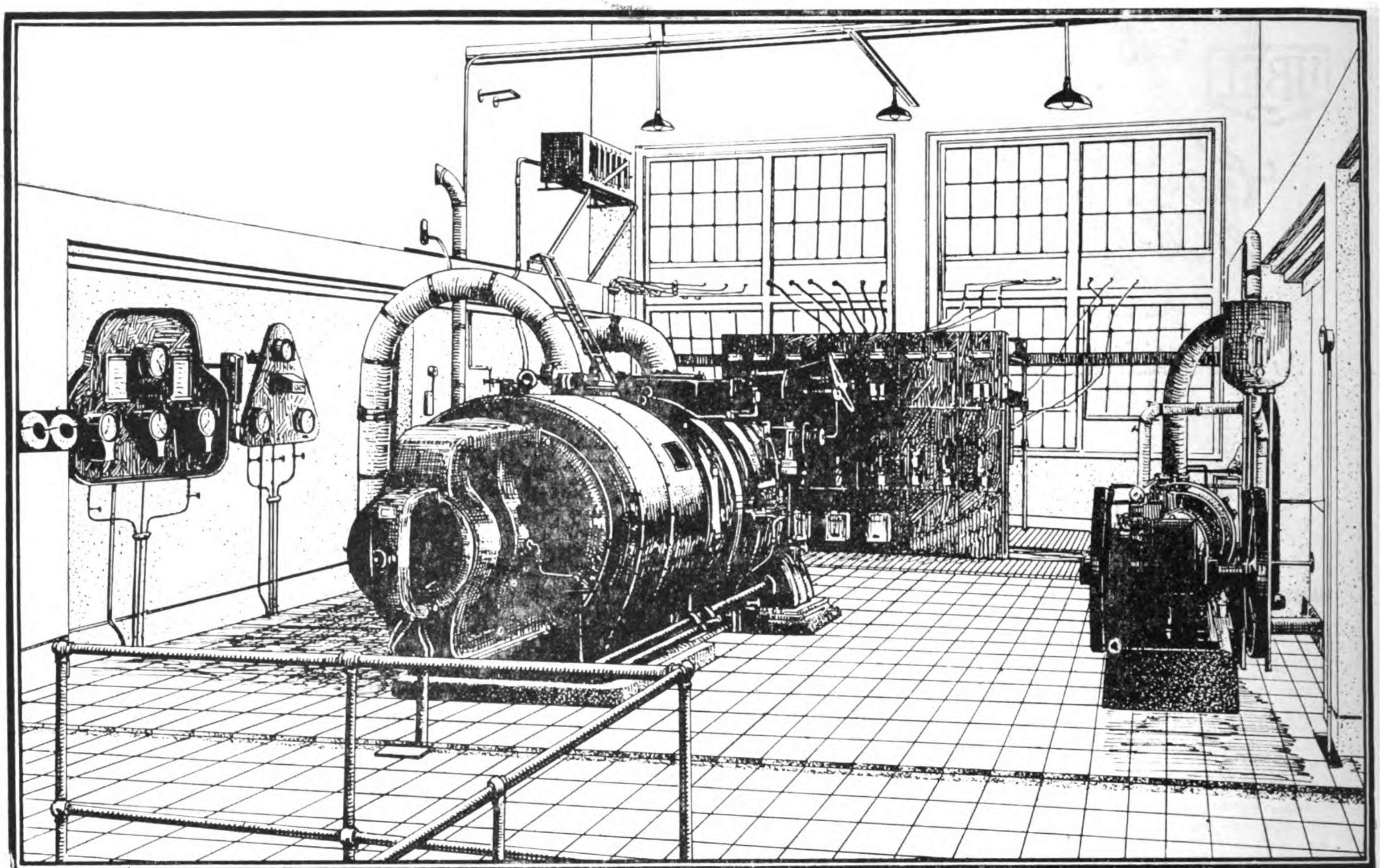

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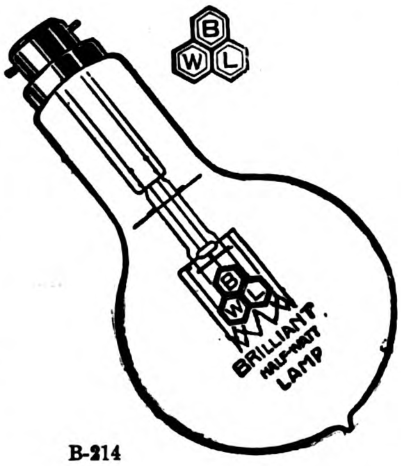

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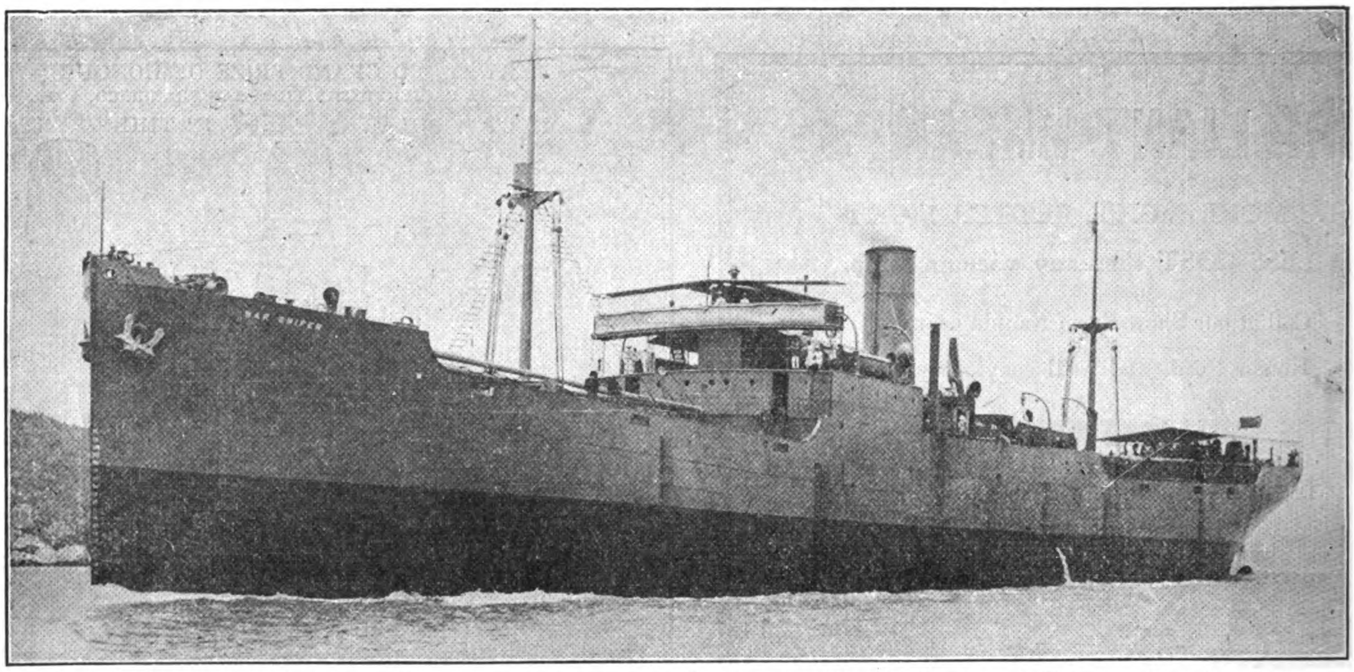

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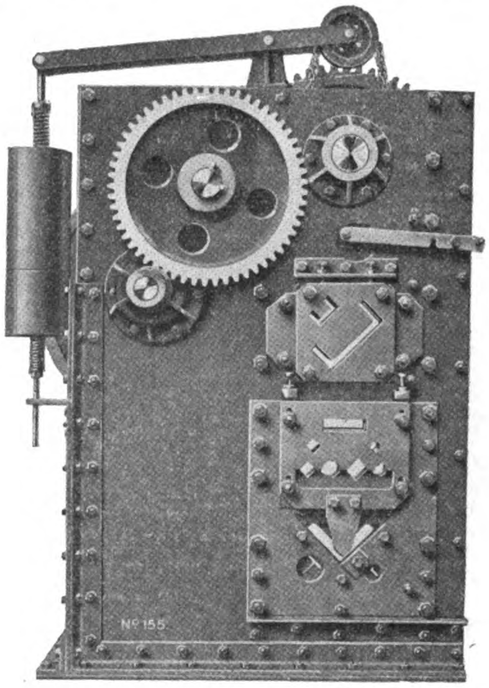

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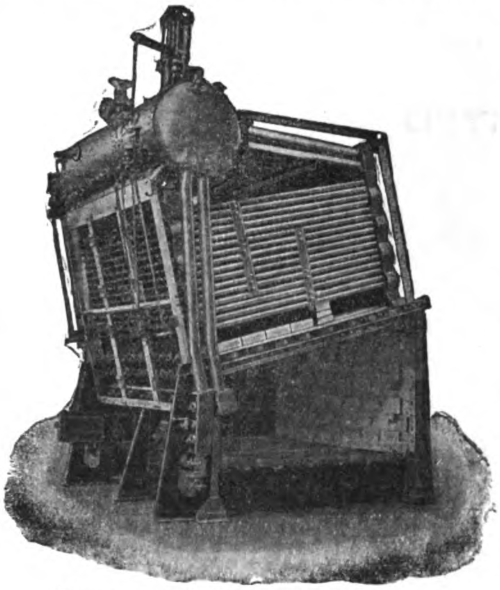

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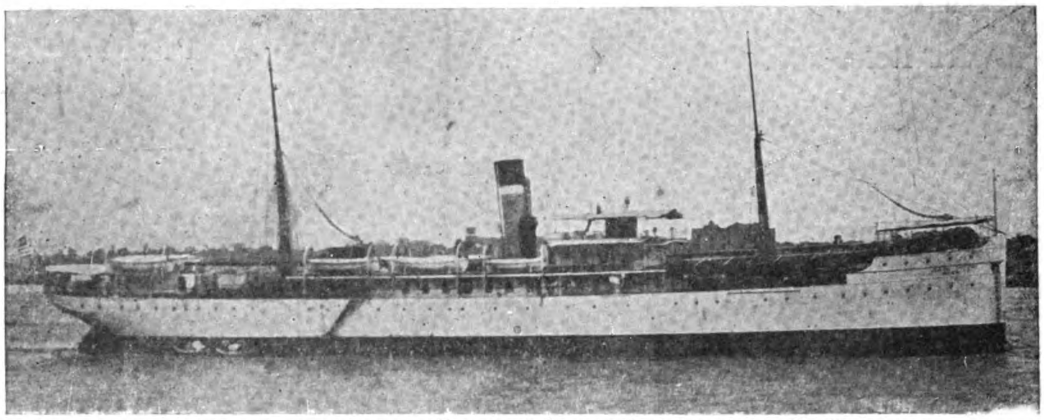

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The Dock charges are the most moderate in the Far East.

The Company's Yards and Docks cover 96 acres. The Water Frontage is about 1½ miles in length. Wharves and Pontoons are arranged where steamers can moor during repairs ; and slips for hauling up small vessels are provided. Sheer legs capable of lifting 65 tons are placed at the various Docks.

The extensive Shipbuilding yards and workshops, lit by Electric Light, are provided with the latest improvements, such as travelling cranes of 60 tons' capacity, hydraulic and pneumatic machinery and tools.

Low Pressure Hot Water and Steam Heating Installations

CALL FLAG FOR VESSELS IN SHANGHAI HARBOUR
"F.B." INTERNATIONAL CODE

Berths for Building Steamers up to 10,000 tons Deadweight Capacity.

Representatives and workmen attend vessels at Woosung and outports on request.

☛ Telegraphic and Wireless Instructions from vessels promptly attended to

ENQUIRIES SOLICITED

Light railway lines are laid throughout workshops and yards.

A Staff of Divers, and powerful salvage appliances, and Floating Cranes ready for any emergency at short notice. Enquiries immediately attended to.

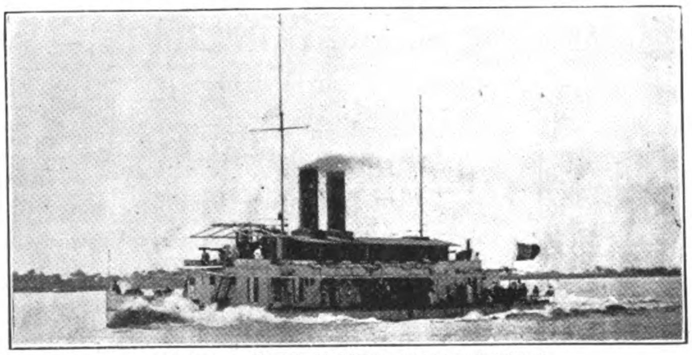
Estimates given for all classes of work: Coast Steamers, Side and Stern Wheelers, Tugboats, Launches, Steam Barges, Dredgers, Floating Cranes, and Lighters a speciality.

Every description of repairs and renewal work undertaken and expeditiously executed.

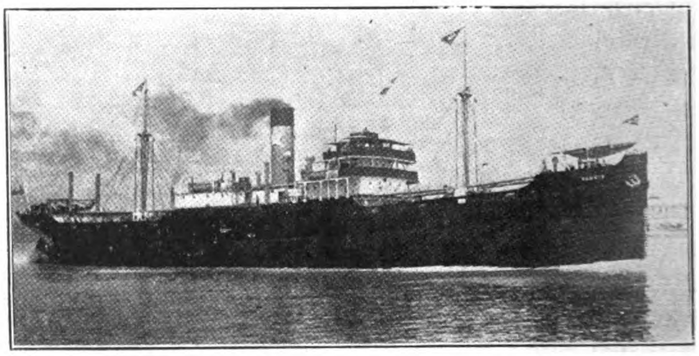
Motor, Land and Marine Engines and Boilers, Centrifugal, Mining, and other pumping machinery always in stock or in progress, also power driven Machine Tools. Engineer's Hand Tools, Steam, Gas, Oil, and Electric machinery and Engineering accessories generally.

PARTICULARS OF DRY DOCKS

Names	Length on Blocks	High Water	
		Breadth of Entrance	Depth of water on Sill
Cosmopolitan Dock ...	700 feet	80 feet	27 feet
International Dock ...	528 ,,	77 ,,	23 ,,
Old Dock	399 ,,	53 ,,	16 ,,
Tunkadoo Dock ...	350 ,,	67 ,,	16 ,,



H.I.M.S. "ERMANNO CARLOTTO"
Designed and Constructed for the Royal Italian Navy
Length 160 feet. Twin Screw Engines.
Draft 2 feet 10 inches with full equipment and 30 tons of coal on board. Mean continuous speed 14 knots per hour.



s.s. "YANNIS" ex "WAR TIARA"
Sister Ship s.s. "PANAGIS" ex "WAR DIADEM"
Sister Ship s.s. "MELLON" ex "WAR REGALIA"
Built for the British Government.

WERF GUSTO (Firma A. F. Smulders)

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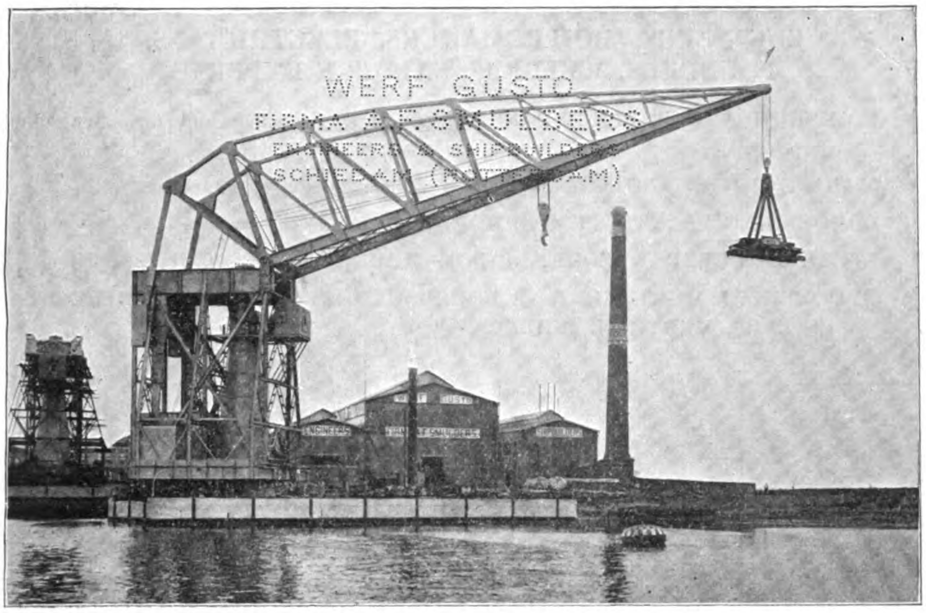
38 VICTORIA STREET, LONDON. SW 1. Tel. Vict. 3887



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FLOATING CRANES of great power, from 50 to 400 tons and more (of late years we have supplied 24 of these cranes from 60 to 400 tons.)

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COALING VESSELS AND COALING ELEVATORS for bunkering steamers mechanically at rates from 150 to 1,000 tons per hour and upwards.

PASSENGER AND CARGO VESSELS, TANK STEAMERS, TUGS, Etc.

BOILERS of all kinds, land and marine.

BRIDGE, ROOF & CONSTRUCTIONAL STEEL WORK of every description by our own Boiler and Girder Works.

A. F. SMULDERS, Grace Berleur,
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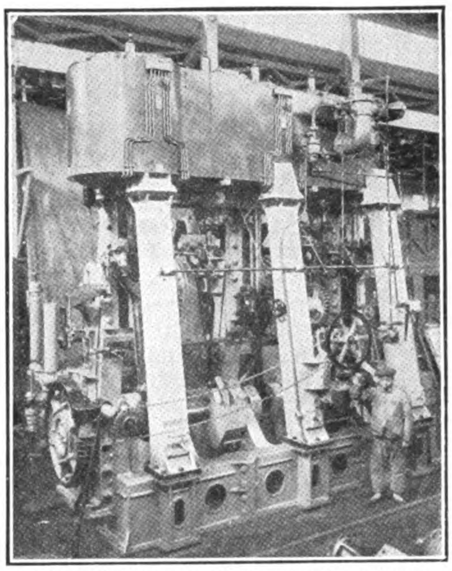

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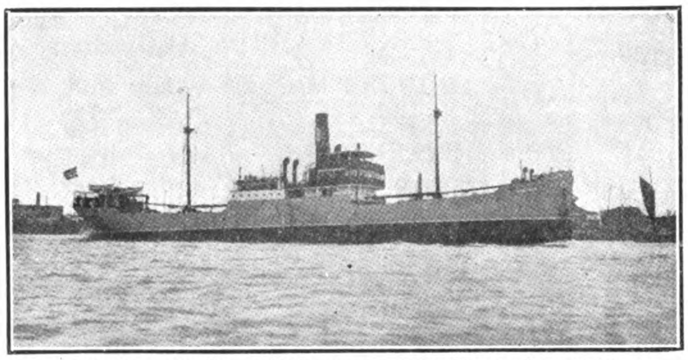

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Ocean and River Craft Oil Carriers

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Steam or Motor Driven

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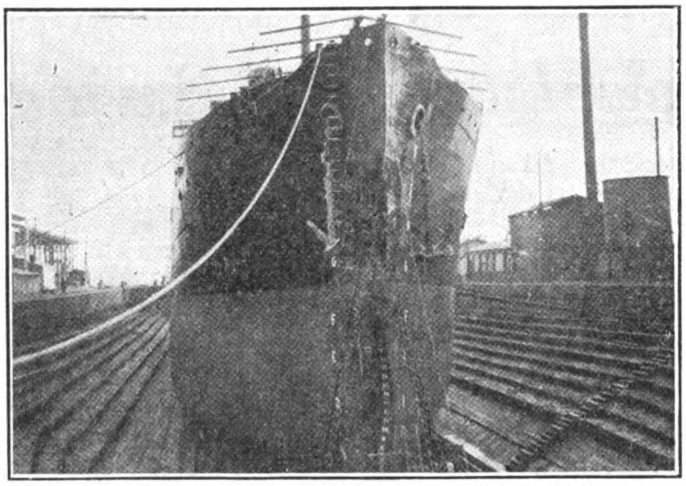


7,000-ton Steamer Docked for Repairs of Damage Sustained in Collision

DOCK PROPRIETORS

Yangtszepoo Dock

Length	577′-0″
Entrance	70′-0″
Width of Sill	60′-0″
Depth on Sill	20′-0″

Patent Slips

for vessels up to 200-ft. long

Vessels docked promptly

General Repairs, Annual Overhauls and Re-classification Work executed efficiently and expeditiously under European Supervision.

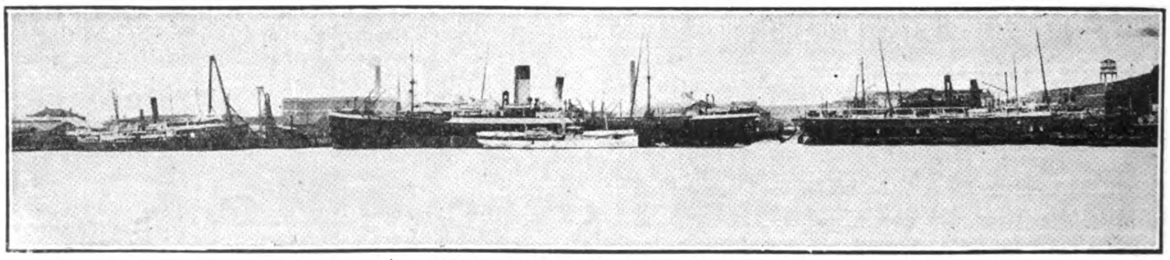
Moderate Charges

Vessels undergoing repairs accommodated at wharves alongside Works.

The Works are equipped with the latest Machine Tools, Electric Drills, Pneumatic and Hydraulic Plant and Tools, Quasi-Arc Electric Welding and Oxy-Acetylene Welding, Galvanizing Plant.

Salvage Experts, Divers and a comprehensive Salvage Plant. Floating Cranes to lift 50 tons and Sheerlegs to lift 80 tons.

THE PROPERTY OF THE COMPANY COVERS AN AREA OF ABOUT 40 ACRES with a RIVER FRONTAGE of 1,800-ft.



General View of Works from River Side

Showing 8 Steamers Berthed Alongside Undergoing Repairs.

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"DOCK" DAIREN

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Engineering, Scott's, Lieber's
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and
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KAWASAKI DOCKYARD CO., LIMITED

CONTRACTORS TO THE IMPERIAL JAPANESE ARMY AND NAVY AND TO FOREIGN GOVERNMENTS

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ESTABLISHED 1870

STEEL MAKERS, SHIP-OWNERS, LOCOMOTIVE BUILDERS, SHIPBUILDERS, ENGINEERS AND REPAIRERS

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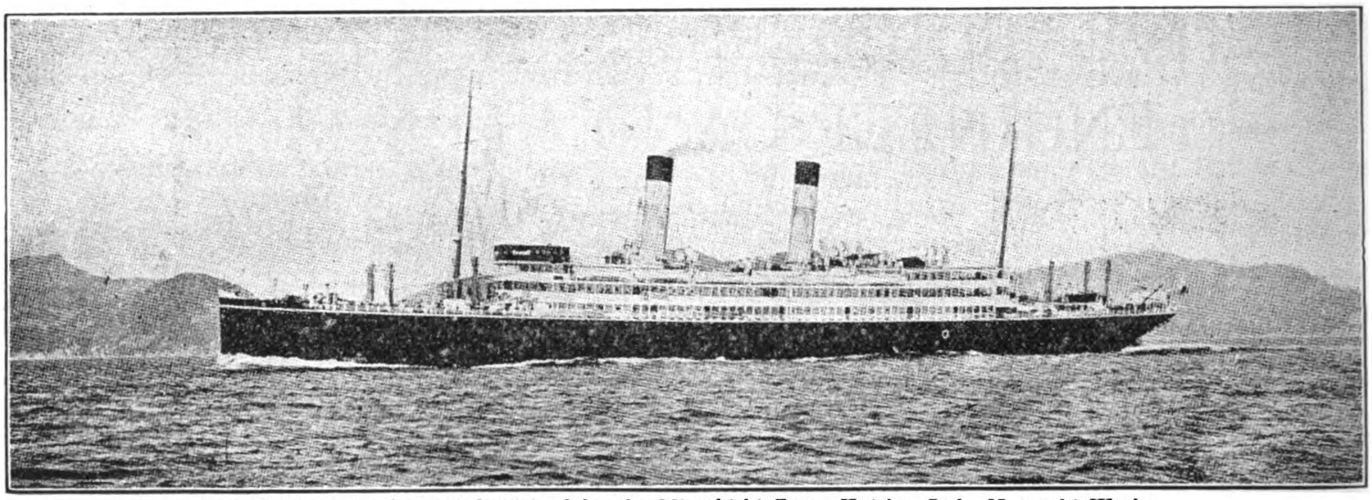

The *Tenyo Maru*, built and engined by the Mitsubishi Zosen Kaisha, Ltd., Nagasaki Works

MITSUBISHI ZOSEN KAISHA, LTD., NAGASAKI WORKS

(ex Mitsubishi Dockyard & Engine Works, Nagasaki)

DOCK No. 1			DOCK No. 2			DOCK No. 3		
Extreme Length - - - - -	523	Ft.	Extreme Length - - - - - -	371	Ft.	Extreme Length - - - - - -	728.9	Ft.
Length on Blocks - - - - -	513	,,	Length on Blocks - - - - - -	350	,,	Length on Blocks - - - - -	714	,,
Width of Entrance on Top - -	89	,,	Width of Entrance on Top - - -	66	,,	Width of Entrance on Top - -	99½	,,
,, ,, ,, ,, Bottom-	77	,,	,, ,, ,, ,, Bottom -	53	,,	,, ,, ,, ,, Bottom -	88½	,,
Water on Blocks at Spring Tide	26½	,,	Water on Blocks at Spring Tide -	24	,,	Water on Blocks at Spring Tide	34½	,,

THE BEST EQUIPPED SHIPBUILDING PLANT IN THE FAR EAST

With Special Facilities for Handling the Heaviest Castings and the Repairing or Building of Ships, Engines, and Boilers
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LARGE STOCK OF MATERIAL AND FITTINGS ALWAYS ON HAND

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While the price of this extra quality sheet is quite naturally and necessarily higher than the well-known APOLLO brand, the charge therefor is only sufficient to cover the additional cost of manufacture. For Roofing and Siding of PERMANENT structures this high grade sheet is recommended without hesitation, the extra life more than making up for the increased first cost.

Our STAR brand sheets are offered only in formed material, such as Corrugated Roofing, Siding, Etc.

United States Steel Products Company

THE BUND AND CANTON ROAD, SHANGHAI, CHINA

22 WU LIANG TA JEN HUTUNG, PEKING, CHINA

15 NAKADORI MARUNOUCHI, TOKYO, JAPAN

MITSUBISHI IRON AND STEEL CO., LTD.

(MITSUBISHI SEITETSU KAISHA, LTD.)

HEAD OFFICE: MARUNOUCHI, TOKYO

CAPITAL: (PAID UP) YEN 30,000,000

MILL (LLOYD'S APPROVED) KENJIHO, CHOSEN (KOREA)

PRODUCTS PIG IRON—Basic & Foundry 100,000 tons.

STEEL—High Tensile & Mild Steel 50,000 tons.

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MITSUBISHI MARINE & FIRE INSURANCE Co., Ltd.

MITSUBISHI KAIJO KASAI HOKEN K. KAISHA

Head Office:

MARUNOUCHI, TOKYO

SUBSCRIBED CAPITAL - - Yen 5,000.000

PAID-UP CAPITAL - - - „ 1,250.000

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YOKOHAMA

WITH TWO BRANCHES IN TOKYO

BRILL TRAMCARS

The construction of electric tramcars and trucks for service all over the world has engaged the facilities of the Brill Organization for the past 48 years.

East, West, North and South Brill-built tramcars and trucks have gone to live up to that reputation for correctness of design and workmanship that is largely responsible for the development of the Brill business to a place of international importance.

THE J. G. BRILL COMPANY

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Superior Barrel Shooks Bear This Trade Mark

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CALIFORNIA BARREL CO.

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CABLES "KOSTER"
ALL CODES

TOSHIN SOKO

KABUSHIKI KAISHA

WAREHOUSING, FORWARDING AND EXPRESS CO.

SHIPPING	BROKERS
LANDING	STEVEDORES
CUSTOM HOUSE	WAREHOUSEMEN

WAREHOUSING AREA - - - - - - - - - 77,000 tsubo (308,000 Sq. yds.)
VALUE OF GOODS IN WAREHOUSE (latest date) - - - Yen 275,000,000
CAPITAL (PAID UP) - Yen 5,000,000; RESERVE FUND - Yen 3,098,400

President: TOKUEMON MITSUI
Managing Directors: S. YADA and H. OKUMURA
Directors: K. HAYASHI and K. FUKUI
Auditors: T. MITSUI and T. MAJIMA

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WILLIAMS' SUPERIOR DROP-FORGED HAMMERS

Are dependable tools because :—

Their heads, drop-forged from a special grade of tough steel, carefully hardened and tempered, neither crack, chip nor splinter.

They are fastened most securely and solidly to the handles—can't work loose—can't fly off.

Their handles are made of the best grade of clear, straight-grained hickory, flared at the grip to prevent hand-slip.

The weight and length of each tool are properly proportioned to give perfect balance, and, hence, increased striking power.

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The phenomenal speed of this machine, its supreme simplicity and its low cost of upkeep, are due to the revolutionary improvements in its design and construction—the outcome of 40 years of experience in the manufacture of cigarette machinery.

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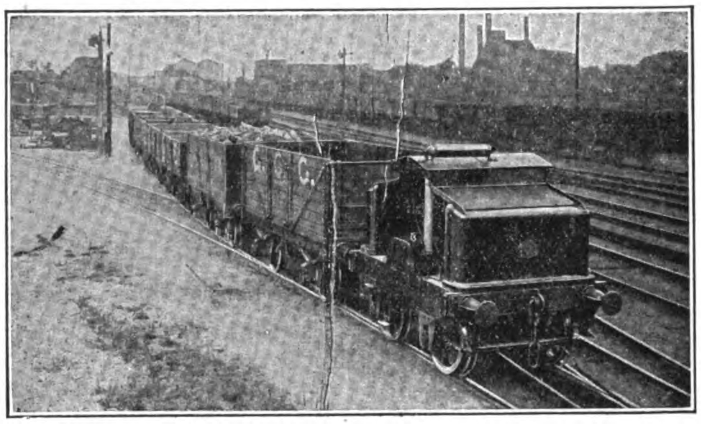
LIGHT RAILWAY ENGINEERS

Manufacturers of Internal Combustion Engines; Locomotives, Rail-Inspection and Tramcars



40 H.P. Loco Working on Main Line Siding

These vehicles are thoroughly reliable, economical, inexpensive to maintain, easily handled and entail no stand-by losses

All kinds of Light Railway Material supplied

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FAST SERVICES:—

Japan, China, Hongkong, Philippines, Straits and Java to Europe via Suez Canal and to New York via Suez and Panama Canals also

Trans-Pacific between Oriental ports and West Coast of N. America.

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KOKUSAI KISEN KAISHA

Nominal Capital	- -	Yen 100,000,000.00
Paid-up Capital	- -	„ 87,500,000.00
Aggregate Tonnage	- -	500,000 Tons

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Name	Tons D.W.	Name	Tons D.W.
Rozan-Maru	8,700	Seifuku-Maru	9,100
Vancouver-Maru	9,100	Suez-Maru	6,600
Boston-Maru	8,800	Daio-Maru	9,000
Tofuku-Maru	9,100	Kashu-Maru	8,800
Chifuku-Maru	9,100	No. 2 Kifunesan-Maru	5,000
Ryufuku-Maru	9,100	Yousan-Maru	5,000
Hankow-Maru	6,400	Taisan-Maru	5,000
Yoni-Maru	11,000	Yuri-Maru	11,000
Taibu-Maru	8,900	Texas-Maru	11,000
San Francisco-Maru	9,100	Tamatsu-Maru	6,600
Naple-Maru	9,100	Eifuku-Maru	9,100
Glasgow-Maru	9,100	Kifuku-Maru	9,100
Yayoi-Maru	8,700	Toyofuku-Maru	9,000
Yaye-Maru	11,000	Raifuku-Maru	9,100
Malta-Maru	8,700	Keifuku-Maru	9,100
Buyo-Maru	8,800	Washington-Maru	9,100
Brazil-Maru	9,100	Tokufuku-Maru	9,100
Kofuku-Maru	9,100	Portland-Maru	9,100
Yezari-Maru	6,900	England-Maru	9,100
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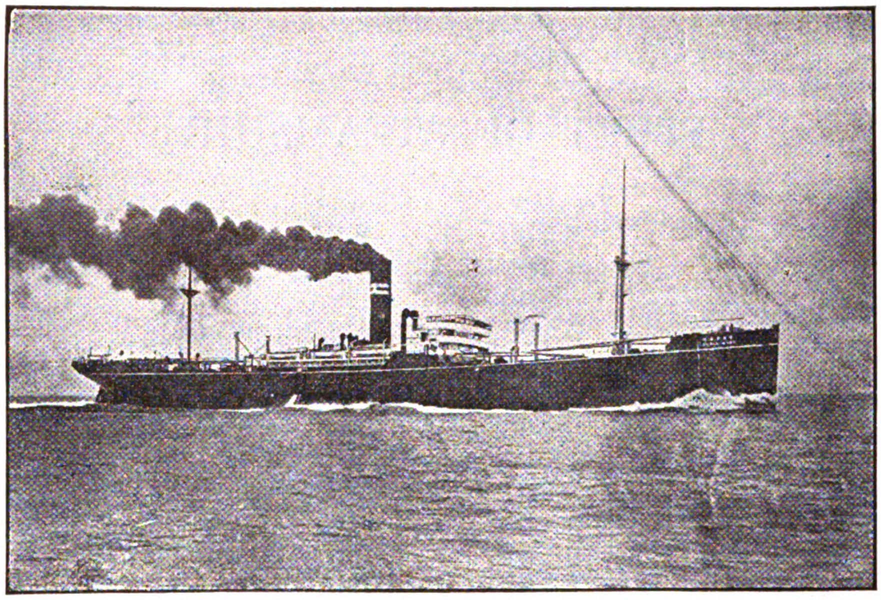
Capital: Y. 100,000,000

Reserves: Y. 66,000,000

40 Regular Lines with a Fleet of 500,000 Tons Gross.



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JAPAN-EUROPE LINE (via Suez)—Monthly—Ports of Call: Yokohama, Kobe, Moii, Shanghai, Hongkong, Singapore, Colombo, Port Said, Marseilles, London, Antwerp, Rotterdam and Hamburg.

JAVA-EUROPE LINE:—Monthly—Ports of Call: Sourabaya, Padan, Colombo, Port Sudan, Suez, Genoa, Marseilles, Antwerp and Hamburg.

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SINGAPORE-NEW YORK LINE:—Monthly—Ports of Call: Singapore, Hongkong, Shanghai, Moji, Kobe, Yokohama, San Francisco, Balboa, Cristbal, Havana and New York.

JAPAN-BOMBAY LINE:—Fortnightly—Ports of Call: Yokohama, Yokkaichi, Osaka, Kobe, Moji, Hongkong, Singapore, Colombo and Bombay.

HONGKONG-PUGET SOUND LINE:—Fortnightly—Ports of Call: Hongkong, Manila, Keelung, Shanghai, Nagasaki, Kobe, Yokkaichi, Shimizu, Yokohama, Victoria, Seattle, Tacoma and Vancouver.

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JAPAN-AUSTRALIA LINE:—Monthly—Ports of Call: Yokohama, Kobe, Osaka, Moji, Hongkong, Manila, Sydney, Melbourne and Adelaide.

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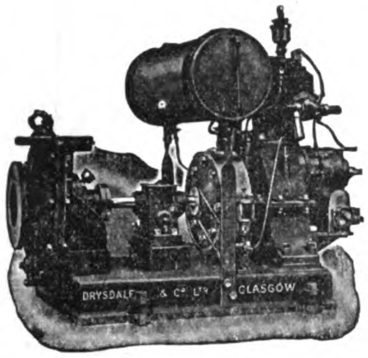

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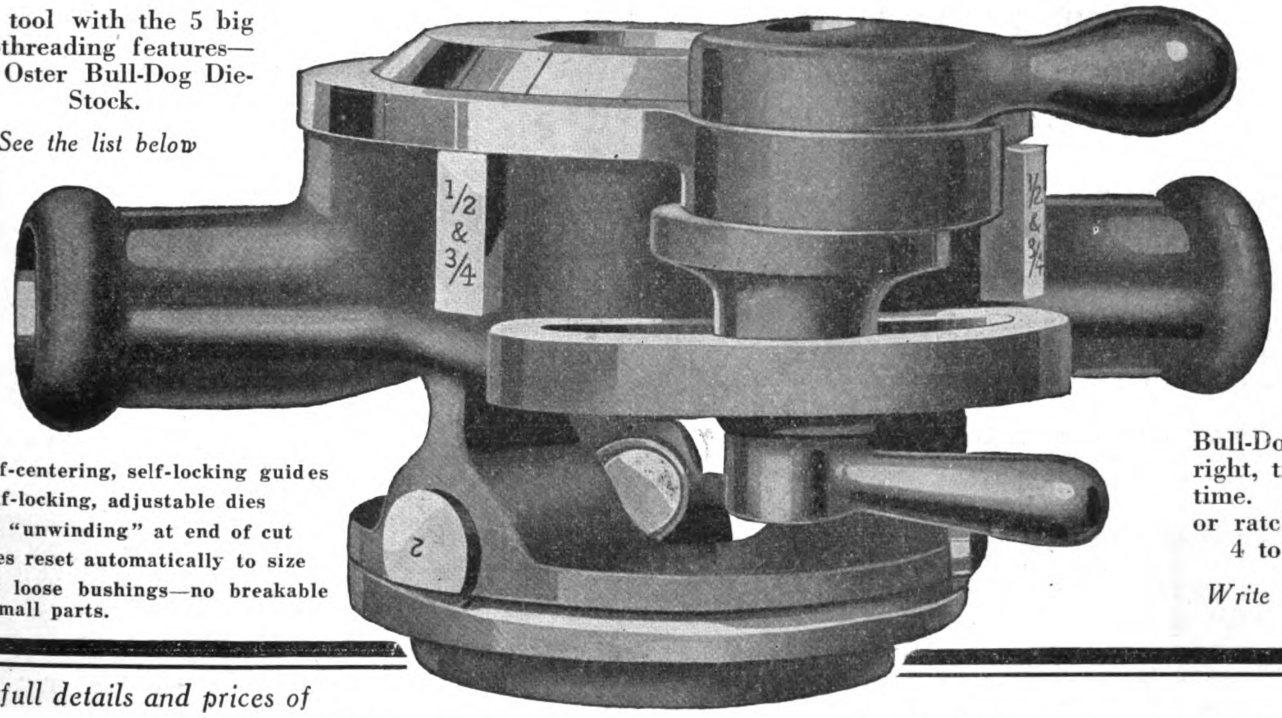

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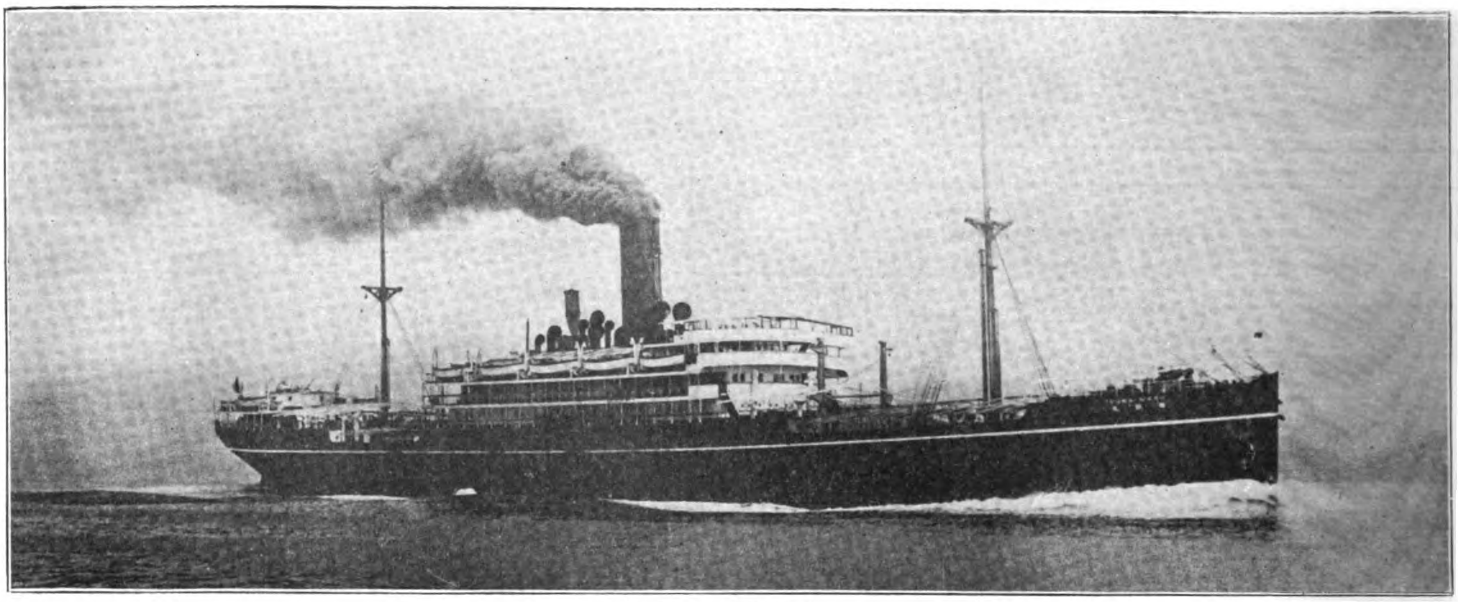

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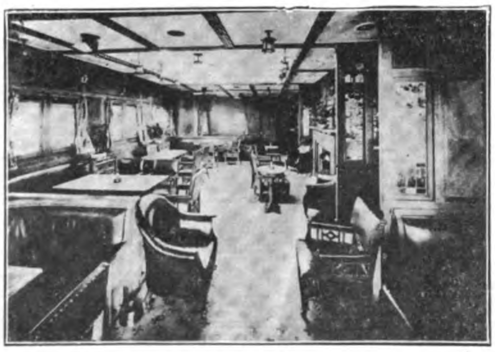

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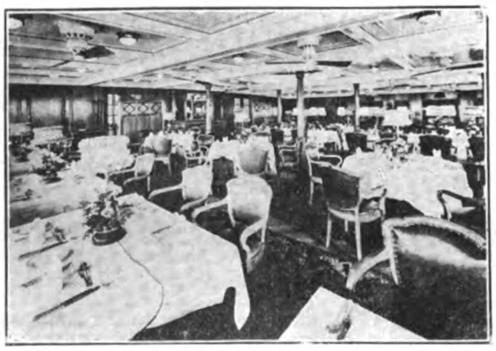

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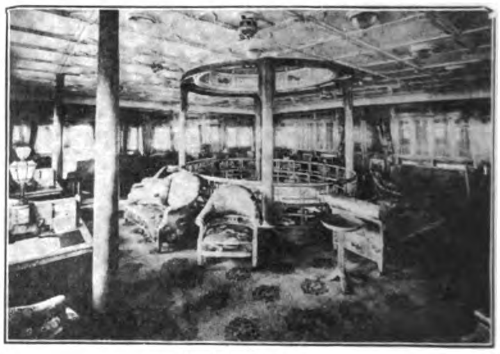

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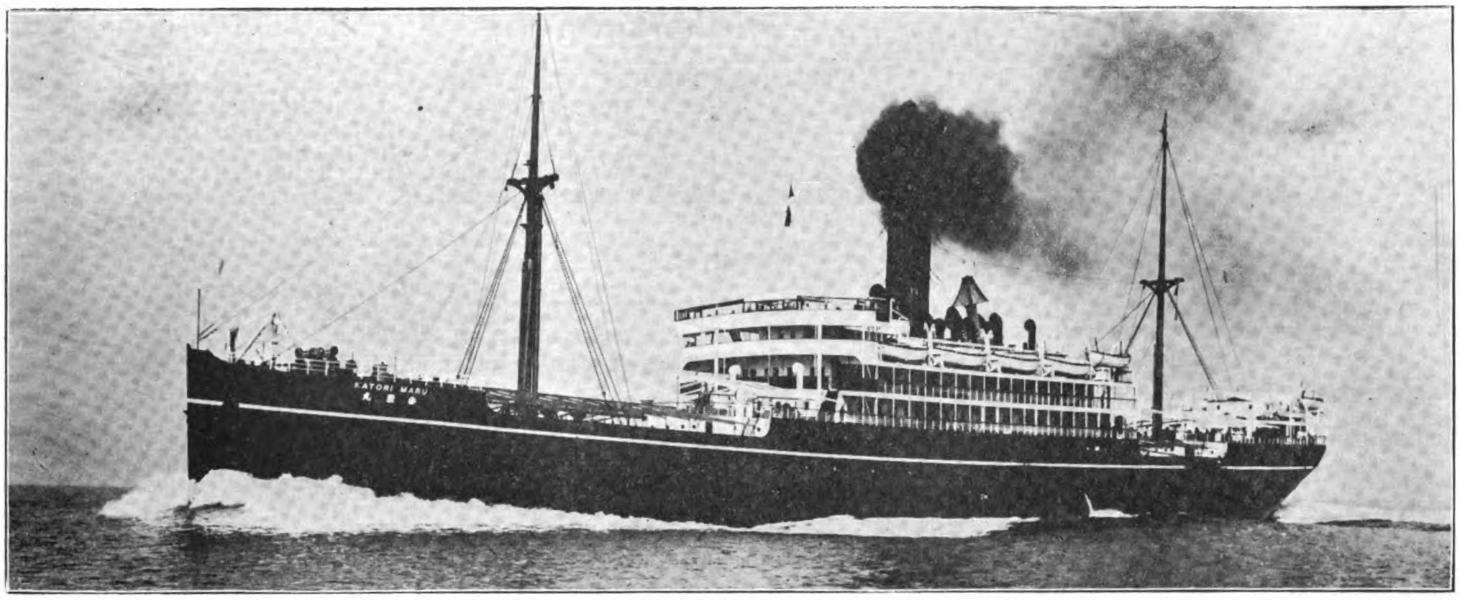

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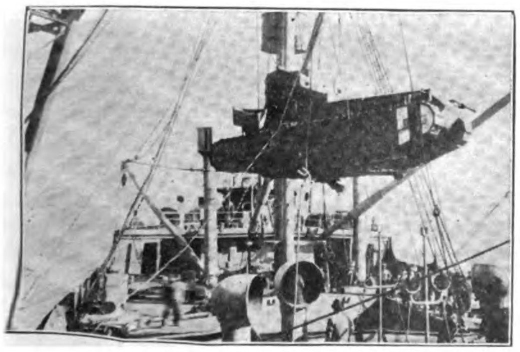

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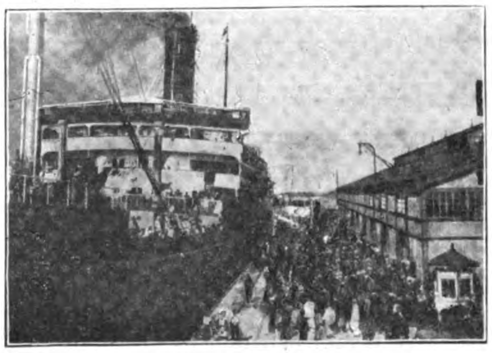

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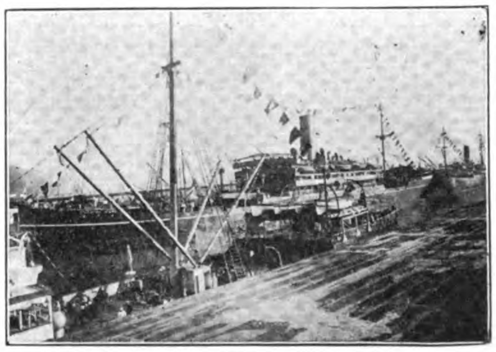

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The Far Eastern Review

ENGINEERING FINANCE COMMERCE

VOL. XVIII SHANGHAI, MAY, 1922 No. 5

THE CONSORTIUM

An Analysis of its Usefulness

IT is now three years since the first meeting of the consortium was held in Paris, and as yet it can hardly be said that any practical results have come out of this new alignment of international finance other than establishing a policy of international co-operation to supersede international competition, and a tightening of the international money market against indiscriminate and reckless borrowing on the part of China. Much water has passed under the mill since the consortium was organized. The results of the Washington conference have deprived it of political significance, superseding the agreements arrived at between the bankers by more effective understandings ratified into international law for a period of ten years. The consortium stands to-day as a purely business proposition supported by its various governments for the sole purpose of eliminating a competition that would be taken advantage of by unscrupulous Chinese officials and financial adventurers to plunge the country deeper into the mire of insolvency. On another page of this number of THE FAR EASTERN REVIEW will be found the speech of Sir Charles Addis on the work of the consortium together with his conclusions that if it should fail to function, its dissolution would revive the spheres of influence with the intensification of international rivalries and jealousies which marked the period of 1898-99, knowh as the "Battle of Concessions." If we admit that the treaties arising out of the Washington conference are to have any binding force, it is difficult to subscribe to these conclusions. With the recognition of China's full sovereignty, the spheres of influence have been abandoned and cannot be readily revived, whether the consortium functions or not.

In presenting arguments in favor of the consortium, Sir Charles has unnecessarily emphasized a possibility, that in the very nature of things, has vanished from the Far Eastern political stage. The one tie binding the international banking groups together at this time must be one of mutual assistance in financing China, in order to eliminate wild-cat loans and so prevent complete financial chaos, intervention, and international control of Chinese revenues for the service of past loans.

Sir Charles also advocates the practicability of negotiating with an autonomous or group of autonomous provinces for the construction of specific railway undertakings within their respective borders, and in doing so reverts to the plan proposed by the writer as the basis of Sun Yat-sen's national railway corporation in 1912. In the January, 1915, number of THE FAR EASTERN REVIEW, under the title of "The Status of the Chinese National Railway Corporation," the plan of financing Chinese railways through loans secured on provincial revenues guaranteed by the central government, was fully outlined. At that time, at the very inception of the republic, it was assumed that the new order would embrace a recognition of provincial rights in railway construction, and, that owing to the inability of the central government to allocate specific revenues for the security of such loans, the financiers could fall back on provincial revenues, with the added guaranty of the general revenues and good faith of the central government. It was assumed that the republican government would be organized on a basis of municipal and provincial autonomy with jurisdiction over public works and improvements within their boundaries, and that railway work could proceed without reference to the Peking government, except wherever such lines became inter-provincial, when control over rates and traffic would come under the central authority. Such a plan, harmonizing with the political tendency of the times, was, however, after most careful study, rejected by Dr. Sun Yat-sen and his advisers as involving insuperable difficulties arising out of independent negotiations with the various provincial authorities. Dr. Sun knew China and the limitations of his so-called republican governors and provincial parliaments, and realized that their ideas of autonomous rule had not reached that stage of enlightenment where such negotiations could be carried on successfully without resorting to bribery in its most obnoxious forms. Here, then, at the very outset of the new republic, its founders clearly recognized that railway negotiations, to be successful, would have to be centralized under some responsible bureau representing the federal government. At that period, there was some reason to hope that a constitutional central or federal government based on provincial autonomy would emerge from the uncertainty then prevailing. Ten years have passed. Chaos reigns in all the provinces. They are autonomous to the extent that they are dominated by military chieftains who acknowledge no allegiance to any central authority. To negotiate with any one of them separately in the matter of railways within their jurisdiction, would not only inaugurate a new era of unbridled graft, but make difficult re-establishment of the central authority.

Aside, however, from this aspect of the railway problem, the consortium faces a more delicate and serious political question in placing such a plan into operation. The groups composing the consortium cannot dissociate themselves from their respective foreign offices. The present consortium is the instrument of their governments, called into being at the special invitation of the American government, and hammered into an effective organization, through determined diplomatic support. The consortium is, therefore, political in every sense of the word, as much a part of the diplomatic machinery of the four powers whose support permits it to exist, as the embassies and legations through whom all matters are referred to the home authorities.

If the consortium, at this juncture, should initiate direct negotiations with any of the so-called autonomous provincial governments for the construction of railways, would not this constitute a formal recognition of such governments? Can the consortium initiate negotiations with Canton without conferring on that government some sort of official recognition of its status? As with Canton, so with any other of the independent or semi-independent *tuchuns*. Official recognition on the part of the foreign governments to Canton or any other so-called autonomous provincial government through their financial instrument, the consortium, would, under existing circumstances, tend to further complicate the situation, as all such negotiations must, in the end, receive the sanction of some recognized central government in order to safeguard the bondholders.

It is not difficult to sense that in advancing this argument Sir Charles had in mind the immediate resumption of work on the Canton-Hankow line, which, pending unification of the north and south, must involve negotiations with the Canton government. The Hukwang agreement covering the financing and construction of this important trunk line, provides only for the section between Wuchang and the Kwangtung border. For the line to be profitable and operated successfully, the Chinese section from the Kwangtung border to Canton (known as the Kwangtung Yueh-Han railway), would have to be taken over by the central government and brought under the consortium agreement. Here, we have a typical case of the difficulties surrounding railway finance in China. That portion of the Canton-Hankow line embraced in the Hukwang agreement and now pooled in the new consortium, must depend upon the privately controlled Chinese section in Kwangtung to reach a deep-water terminus at Canton or Hongkong, and, unless the latter be absorbed so that the entire railway can come under one management, the main section will always be at the mercy of the other. Any negotiations for a new loan to proceed with the uncompleted sections in Hunan embraced in the Hukwang agreement, must of a necessity, cover the taking over of the Chinese controlled Yueh-Han line, and here, pending unification of the country, the consortium must perforce deal with the Canton government.

This, undoubtedly, is what Sir Charles had in mind in advocating the opening of negotiations with autonomous or a group of autonomous provincial governments. In this instance, there is some force to the argument, as under any circumstances, the Yueh-Han line stands as a provincial property, independent of the ministry of communications at Peking, and if any agreement can be reached with the provincial company that would permit the consortium to take over the property and complete the section between Yintak and the Hunan border, it would assure the successful and profitable operation of the through trunk line whenever it is completed. It means, in effect, purchasing the property from the provincial company and holding it in trust for the Chinese people until such time as it can be incorporated in a larger loan with a stable central government for the completion of the other sections. While perhaps not involving recognition of the southern republic, it does emphatically involve recognition of the Kwangtung provincial government, a most essential part of the southern republic. Recognition of one would seem to imply recognition of the other, though perhaps international lawyers might find some precedent for negotiating with the autonomous province without compromising the consortium into recognizing the southern republic.

The arguments advanced by Sir Charles, indicate that the consortium is having a difficult time in breaking through the many obstacles that lie in the path of its success. As the head of the British group, Sir Charles is naturally interested in any plan that will hasten the completion of the Canton-Hankow line, while the other groups are equally interested in seeing some of their own pet projects realized. Although working in complete harmony, the various groups in the consortium have their own ideas of what work is most important to be carried out without delay. The American group has a natural preference towards starting work on the Hankow-Szechuan line and the Grand Canal, while the Japanese would like to see the extensions of the Shantung line taken up as soon as possible. Here, we strike other snags in the smooth working of the consortium, as we find that the two lines in Shantung surrendered to the consortium by the Japanese group are handicapped at the outset by a loan of $20,000,000 advanced by Japanese bankers to the Peking government on the security of these lines. These funds were dissipated by the Peking government in internal warfare, so the lines must now be saddled with this extra cost at the outset of any final negotiations, thus diminishing legitimate returns from the larger investment necessary to build them. If the main Shantung line had been handed over to the consortium instead of being returned to the Chinese government, these extensions could have formed part of the main system and the extra financial load of $20,000,000 more evenly distributed. Forming part of the Shantung Railway, under one management, the loan for building the two extensions would have materially increased the capitalization of the main line, without any undue strain on the earning capacity of the system. In this question, the Japanese lost a most valuable point at Washington, and at the same time, made the task of the consortium more difficult. As it is, the Chinese get possession of the main line of the system, while the important branches pooled in the consortium must stand on their own bottom and carry the interest load of a $20,000,000 advance, in addition to their actual cost of construction. Under these conditions, the financing of these extensions under the consortium may encounter difficulties, not only in negotiating a final contract with the Chinese government but in issuing the bonds afterwards. Much will depend upon the terms China is willing to agree to, and the extra burden may call for special terms if the lines are ever constructed.

On the other hand, Americans, especially the American International Corporation holding the Siems-Carey contracts, are interested in pushing through the Hankow-Szechuan line and starting work on the Grand Canal. These contracts stand on their own bottom, with such terms as should permit the loans to be raised at any time the bond market is favorable. On all the old railway contracts pooled in the consortium, the loan terms and conditions must be revised in order to enable the floating of a new issue. Here, sooner or later, the consortium must come to the Chinese and open negotiations. The terms of the Siems-Carey contracts, however, with their twenty per cent. participation in the profits of operation, eight or ten per cent. construction profits, five points commission to the bankers, and five per cent. on the purchase of materials, with chief engineer, auditor and traffic manager to assure the proper expenditure of the loan funds and direction of operation, should be ample enough to assure the success of a loan with which to proceed with construction. The same pertains to the financing of the Grand Canal. The Japanese partners in that scheme are favorably disposed towards raising their share of any loan for immediate resumption of work, but the New York market appears to fight shy of Chinese bonds.

Even in the matter of the Hankow-Szechuan lines, a clash of interests must arise whenever the time arrives for issuing a loan for its construction. It will be recalled that the original four power consortium (in which the old American group was a partner), holds the Hukwang Railway contract which embraces the line following the Yangtze from Hankow to Chengtu in Szechuan, and that the first section of this line from Ichang to the Szechuan border was designated for the American group to construct. Considerable progress has been made by the American engineers on this section, especially in the matter of surveys, and Mr. Randolph, the American engineer-in-chief, was appointed by the group as its technical representative during the negotiations leading up to the organization of the new consortium. The old consortium, therefore, is very much concerned over its rights to the line into Szechuan, and, whenever the time arrives to seriously consider financing this railway, either the Siems-Carey project or the earlier rights acquired by the four power group will have to be scrapped. One line must go, as the consortium, will hardly care to assume the difficult task of financing two lines into Szechuan at once. The American section embraced in the Hukwang agreement is the only railway contract the American group has placed in the consortium pot. The British group claim a prior right to construct the railway into Szechuan along the route surveyed by the Siems-Carey Company, thus reinforcing their American partners in the Hukwang agreement. The Hukwang agreement itself would be seriously impaired in value by the elimination of the right to build the Szechuan line, where the French also are to construct a section. In the event the present consortium is ever dissolved, and the pooled contracts revert to their original holders, the Hukwang agreement would be shorn of much of its value if the line into Szechuan is surrendered in favor of the Siems-Carey survey, and at the same time, it would eliminate the old American group from any share in prospective railway building in favor of the American International Corporation.

So, no matter where it turns, the consortium path is beset with enough legitimate financial difficulties to discourage the most optimistic banker. Add to this, the absence of any government in China that can provide the necessary guarantees to a loan contract of any nature, and the situation facing the consortium seems hopeless indeed. In effect, the real value of the consortium at the present moment consists in keeping alive the spirit of international co-operation, and through the support of their respective governments, preventing Chinese officials from floating worthless loans through irresponsible bankers. The greatest danger confronting the consortium and China at this junctűre, is that some independent banker whose prestige in the investment field at home would enable him to dispose of the bonds to the public, may enter into a loan agreement with Chinese officials. Such a loan would effectively kill Chinese credit and make extremely difficult any subsequent effort on the part of the consortium to restore confidence. All the available and surplus revenues of the country are already pledged to the hilt. There is always the danger, however, that some unsophisticated banker may listen to the plausible stories of Chinese loan brokers, and accept without investigation a security that looks good on its face, and issue the bonds to his customers. This has been done before and can be put over again. But at this time, there is no excuse for pleading ignorance of conditions, and any banker that would accept without question the securities so offered, would be guilty of a crime.

If the present situation is left to work itself out, with the interest and principal on past loans being defaulted or postponed, the day cannot be long distant when China will have to face international intervention in the control of her finances, or, appeal to the consortium for help.

Because of the huge profits attached to such loans, the Chinese Bankers' Association may advance sufficient funds for the government to eke out a hand-to-mouth existence. On the other hand, there is no serious indication that they will come to front with the funds required to redeem the Shantung Railway, or do any signs exist that their patriotism will soar to the height of saving the Kiangsi line from falling under Japanese control for defaulting the interest payments. The financial outlook is therefore gloomy, with the consortium alone standing between China and disaster.

Should conditions ever warrant the dissolution of the consortium, the consequences can have little bearing upon China's political status. The Washington conference provides guarantees against territorial aggression for ten years at least, and in that time, the more sanguine friends of China believe that she will be well able to take care of herself. Drop the consortium and the consequences reduce themselves to a simple reversion of the pooled contracts and concessions to their respective holders. With all political and territorial phases of these concessions eliminated as a result of the recent treaties, they must be treated on their merits as business propositions. It goes without saying, that under these conditions, the Chinese government will never submit to being coerced into signing a final agreement for the execution of such concessions, as may have been extracted in the past through severe diplomatic pressure. Under this category would come some of the British and French concessions, as well as the Shantung extensions, originally forced from China by Germany, inherited by Japan and handed over to the consortium. The failure of the consortium therefore would simply deprive its pooled concessions of all commercial value. It is folly to assume at this date, that any government would invite world-wide criticism in supporting these concessions by means other than peaceful diplomatic correspondence.

The real danger from a dissolution of the consortium would arise from a renewal of the jealousies and rivalries incidental upon the opening of the field to independent wild-cat finance. Experience teaches us that the average Chinese official with no knowledge of previous committments, or caring less, if he did know, would unhesitatingly enter into new contracts infringing rights previously bartered away, for the sole purpose of obtaining as much bargain money as possible, or, for the more common Chinese object of creating international friction. Here we have a real menace which must be guarded against in the future. Such tactics on the part of Chinese officials encouraged by irresponsible foreign advisers created the situation that compelled the creation of the present consortium as the only way out of a dangerous tangle. The crude attempt in 1916 to force the United States into a show-down with all the allies on the "open door" doctrine at a time when they were fighting for their existence, ended by effectively closing the Chinese railway field to American capital, and compelling the formation of a new consortium as the only way Americans could enter the field at all. What happened before, can happen again if the field is thrown open to independent and irresponsible exploitation by the failure of the consortium. This is the real danger.

There is one more angle to a possible dissolution of the consortium, that should be of special interest to Americans. Drop the consortium, and under the Washington treaties, the Chinese investment field is automatically opened to all. But will American capital take advantage of this opening? We doubt it. The one feature of the consortium that appeals most strongly to American bankers is the international guarantee that the investments will receive adequate diplomatic support. It is the one strong selling argument that assures public subscription to the bonds. The American bond-holder has learned that he cannot always rely on his government for other than ordinary diplomatic support for the protection of his foreign investments. As a consequence, he is remarkably timid in purchasing the bonds of any country whose interior political conditions are chronically unstable. He knows for a certainty that public opinion will never support his government in employing the persuasive measures of other powers in the event of a default of interest or principal. A long-term American loan to China, at this juncture, without a guarantee of something more tangible than the support of the state department would be most difficult to float in America. The four-power guaranty attached to a consortium loan, however, raises a Chinese bond to the ranks of a gilt-edged security.

It is for these reasons that the success and continuation of the consortium must appeal strongly to Americans. If we admit that public opinion at home will refuse to support the American government in employing force for the collection of repudiated or defaulted foreign securities, long-term loans to China for some years to come, will be possible only through the medium of the consortium, the one safe guaranty to the bondholder that his investment will be protected.

With the disappearance of spheres of influence and all danger of territorial aggression through railway and other concessions eliminated as a result of the Washington conference, and the creation of a board of reference to make the "open door" a practical rather than a theoretical doctrine, there remains another important consideration that must be faced should the consortium be dissolved. With the menace of territorial aggression removed, the Chinese might be willing to grant concessions to foreign capital along lines that have proved so successful in developing other backward countries. Sooner or later, under new political conditions, a stabilized China must effect a radical modification of its ideas on concessions if foreign capital is to develop the resources of the country on terms that will assure profitable returns over a period of years. The concession is only another name for a franchise, which, in various forms, has attracted foreign capital into Latin American countries without in any way impairing their sovereignty. Once China is united under a stable government at Peking or elesewhere, it would seem that the results of the Washington conference will create a loop-hole through which the Chinese may avoid dealing with the consortium by granting concessions for the development of their public utilities, which the governments behind the consortium groups would find most difficult to oppose. In the competition for development loans, China may be compelled to accept the commercial concession granting rights of full ownership and operation over a period of years to foreigners, in order to attract capital. Americans might fight shy of such propositions because of the uncertainties surrounding the internal political situation during the next decade, but would all other nations be

as cautious? The scramble for concessions, should the Chinese adopt such a policy, would tax the powers of a board of reference to maintain the "open door" for all. It goes without saying, that concession terms that might be satisfactory to capitalists of one nation, would be rejected by the more cautious American investor, or, *vice versâ*.

It is also clear that jurisdiction over many of the most profitable public utilities must remain under the municipalities and provinces, absolutely free from interference on the part of the central government, a circumstance that would tend to materially complicate the Chinese investment field, and open up a scramble for concessions in which the most valuable would undoubtedly be snapped up by wild-cat promotors. A "Battle of Concessions," such as markered the period between 1898 and 1900, might well result from this condition, and create intense international rivalries and jealousies, such as are prophecied by Sir Charles Addis, but we fail to see how this would in any way affect the political situation after the very precise understandings arrived at in the Washington treaties. The value of the consortium under such conditions would seem to be in acting as a stopper to the issuance of such loans, through the concerted action of its component banks, correspondents and the brokers forming part of their bond-selling organizations. This means that it would have to constitute itself into a financial monopoly in fact, one that because of the pre-eminent position of its groups in their various countries, would enable it to exert sufficient pressure upon outsiders as to nullify their attempt to issue these independent Chinese loans on their respective markets.

These arguments seem to exhaust the case for the consortium, and we can now turn to a partial analysis of why it has failed to win the confidence of the Chinese, for which there must exist excellent reasons other than those put forward to explain the reluctance of the Chinese to recognize it. The consortium incurred the suspicion of the Chinese from the outset. The Chinese made an honest and earnest effort at Paris to pave the way for the success of the new combination, but were thwarted by the views of state department officials directing the negotiations.

At that time, the writer acted as secretary to the Chinese technical commission headed by Mr. Yeh Kung-cho, then in Paris for the purpose of keeping in touch with the organization of the consortium in order that its work might be facilitated and its plans accepted by the Chinese government who recognized the need of proceeding without delay to the construction of much needed trunk railways. I have refrained from making public the Chinese side of the case, but as many books and magazine articles bearing on the Paris conference have been written by others, I can be excused for throwing additional light on these controversial matters.

As I seek no favors from either the Chinese government or the consortium, I can speak freely without being misunderstood or misinterpreted, my sole object being to throw light on an administration, which, to quote the words of Elihu Root, was "incompetent to originate any policy for itself or carry one out if drafted for it by others." The facts herein disclosed will, at this late date, convey to friends in the Japanese, British and French foreign offices, and group financiers in Tokyo, London and Paris, that I faithfully endeavored to carry out a program for mutual co-operation, which met with their heartiest approval and support, at a time of great international stress.

The task of calling an international convention to straighten out the Far Eastern muddle, which the past administration compromised itself on four different occasions to perform, has devolved upon President Harding, Secretary Hughes, and other far-seeing statesmen. Saved from the possibility of war with Japan, the American people are now looking forward to an era of peace, harmony and co-operation in the Pacific, with China's territorial integrity strengthened and safeguarded by a series of treaties to which all interested powers have subscribed. There is one task, however, started by the last administration which remains unfinished. Wilson, Lansing and Reinsch created the consortium. It is left for Harding, Hughes and Schurman to make it work. Perhaps the information outlined in the following pages, will help clear the way towards a solution to this problem.

G. B. R.

The Background of the Consortium

China's Repeated Efforts to Break Down the Spheres of Influence and Solve her Problems in Her Own Way Thwarted by the Wilson Administration

A PERSONAL NARRATIVE

By George Bronson Rea

IN 1912, Dr. Sun Yat-sen received full powers under a presidential mandate signed by Yuan Shih-kai, to organize a national railway corporation, design a national system of railways and negotiate with foreign bankers for their financing and construction. I was invited by Dr. Sun to accept the position of technical secretary to this corporation, and, after assisting him in designing a practical scheme of 10,000 miles of necessary trunk lines, was commissioned to proceed abroad as deputy director general with full power of attorney to initiate negotiations for its financing, preferably under some international financial combination that would take the railways out of politics and eliminate spheres of interest. On arrival in London, in January 1913, the scheme was presented to Sir Charles Addis, head of the British group in the consortium, whose response was that he would take over and finance every mile of railway Dr. Sun had to offer. He arranged a meeting with the engineers of the British and Chinese corporation at which the details were to be discussed. At that time, owing to the inter-group agreement, in made no difference which of the groups signed the preliminary agreement, as all Chinese business was shared equally. Notwithstanding this, at the solicitation of Mr. Willard Straight, then representing the American group, I decided to give Americans the prestige of signing the preliminary agreement, in order that our own group would have something tangible in the general consortium pot, and assure to American manufacturers a market for railway supplies. Postponing further talks with the British group I sailed for New York, arriving there in the latter part of February, 1913, about ten days before the change in administrations. The American group would do nothing until the policy of President Wilson on these matters was made clear. This he did in no uncertain manner within two weeks after assuming office.

Repeated appeals to support the American group in the construction of necessary railways, in combination with the other groups in the old consortium, proved futile. Secretary Bryan de-

claring that he could not endorse a Wall Street monopoly and recommending that I take the proposition to bankers in Denver, St. Paul, St. Louis, Chicago and other thriving Western cities, who, he declared, would be most anxious to take over any large Chinese loan. The situation was hopeless. With the American group outside the consortium, it became impossible to adhere to the original plan of financing the scheme as a whole with an international group and so eliminate the spheres of interest. Despairing of moving the president or the secretary of state from their position, it became necessary to break the scheme into individual contracts, and again, in order to assure full American participation in the development of China, I proposed to Mr. Straight that the American group take over a preliminary agreement for what was called the South-western Trunk System of over 3,000 miles, at that time free from international complications. No advance payments were asked or required. All the American group had to do, was to sign a preliminary agreement and place it in "cold storage" against such time as conditions would enable it to be financed. Even this was rejected, the bankers declaring they would have absolutely nothing to do with China, until such time as the president modified his attitude and requested them to re-enter the field. This was the last opportunity presented to American capital to participate in China's railway development with contracts absolutely free from international political complications. In his zeal to humble Wall Street and pave the way for his federal reserve system, President Wilson, not only closed the door to American development of Chinese railways, but prevented China from eliminating the spheres of interest in her own way and on her own initiative through international co-operation.

Thoroughly discouraged, I proceeded to Europe and unable to resume negotiations with the British group, split the scheme into individual contracts offering them to various world-known contractors in London and Paris. The Pauling contract for the Canton-Chungking line was arranged for, with four other contracts aggregating 4,000 miles of lines under way on the same terms, when the second revolution broke and Dr. Sun's powers were annulled. Returning to China, and explaining the situation to the government at Peking, I was requested to design another national railway system more in harmony with the ideas of the northern authorities for strategic control of the country. This program was then adopted as the basis of a new scheme for eliminating spheres of influence through international finance. I was appointed technical secretary to the ministry of communications and with Dr. Chen Chin-tao, as financial commissioner to conduct the detailed negotiations, authorized to proceed to Europe and organize a new international company for the financing, construction and equipment of the new scheme of 10,000 miles. This plan brought into the field the most reputable and experienced firms of railway constructors as principals to the contract. This international construction company was rapidly organized and a meeting held in Paris on April 22, 1914. The bankers, constructors and manufacturers of the United States, France, Britain and Germany participated equally in the organization of the company, which was to be registered in Switzerland. The greatest European financial institutions stood ready to finance the loans, (aggregating $500,000,000) to carry the scheme into effect. Chinese bankers received the right to share in the underwriting, act as depositories of the loan funds, and participate in the construction profits. The terms agreed upon, 13 per cent. on the financing and cost of construction, were two and a half per cent. less than those allowed by the American government for the financing and construction of the Philippine railways. It was for all practical purposes a new construction consortium called into being, by the Chinese government, to finance and construct a limited scheme of 10,000 miles of new railways, in which Chinese banks were permitted to share in the underwriting profits and Chinese capital brought into the construction companies, with an approximate participation of twenty five per cent. in the shares and profits.

The American participant, Messrs. J. G. White & Company, were not represented at the meeting, and it was voted to hold open their quarter-share in the enterprise until such time as they could guarantee the raising of their proportion ($125,000,000) of the loans. The British, French and German constructors had made all necessary arrangements for their groups to finance their obligations before accepting the offer of the Chinese government. In the meantime, the American company approached the state department to ascertain its attitude towards the scheme. The following official letter signed by Mr. Robert Lansing speaks for itself :—

DEPARTMENT OF STATE WASHINGTON

May 16, 1914.

Messrs. J. G. White & Company

43-49 Exchange Place

New York

Sirs,

I have to acknowledge the receipt of your letter of May 9, 1914, enclosing a copy of letter addressed by the President of your company to Dr. Chen Chin-tao.

In reply to your enquiry as to the attitude which this Government would take towards an enterprise of the character proposed by Dr. Chen, that is to say the organization of an international construction for the financing, construction and equipment of future government railways in China, I have to state that the information furnished the Department seems to indicate an intention on the part of the Chinese Government to grant the proposed company a monopoly of railway construction in China. If this understanding be correct, the proposed plan would appear to be in violation of treaty provisions which forbid the establishment of monopolies.

The Department is earnestly desirous of promoting the extension of American trade in foreign countries by all proper means, but cannot give its support to any enterprise which implies an exclusive right upon the part of any one company or group of companies to build and equip railways in any part of the world.

I am, Sirs,

Your obedient servant,

For the Secretary of State,

Robert Lansing,

Counselor.

It is true that the British government also withheld approval until the scheme was officially submitted for its scrutiny. On receipt of this remarkable communication, I hurried to explain that the company had been called into existence by the Chinese government, for the express purpose of internationalizing the railways and eliminating spheres of interest, and, that a contract for 10,000 miles was well within the right of the Chinese government to enter into, as because of its size, assuring a long period of activity for the bankers and constructors, it enabled China to obtain the lowest possible terms. This communication was never acknowledged. However, I was surprised to learn later on, that another state department official informed the representatives of J. G. White & Company, that it was not so much a question of monopoly that bothered the department, as the fact that joining with other nations in the construction of Chinese railways, would involve many difficult international problems which the American government would wish to avoid as far as possible. This seemed to indicate that motives other than those appearing on the surface, were responsible for this remarkable attitude. However, it is only necessary to emphasize at this point, that what was qualified as highly illegal and in violation of the treaties in 1914 when initiated by the Chinese government, became a most praiseworthy and legitimate international

policy in 1918, after the situation had become so confused that international co-operation through a new consortium became absolutely essential to avoid more serious complications.

On learning the above facts, the Chinese government in July, 1914, ordered a temporary suspension of the negotiations. They were never officially cancelled, and the European participants, after consulting their legal advisers, took the position that their rights in any future reopening of the matter had been firmly established. The war intervened, but the rights of the company remained. On my return to China, the high Chinese officials concerned fully concurred in my views, and it was understood that the scheme should be held in abeyance pending a favorable opportunity to resurrect it. That opportunity never arrived, as Minister Reinsch, anxious to do something practical, personally intervened by proceeding to New York the following year to encourage the formation of a new American combination headed by the Siems-Carey Company to enter the field. When the details of the Siems-Carey contracts finally leaked out in Peking, I realized that a great blunder had been made, one which would result in foreign opposition, diplomatic protests and a closing of the field to American capital. The mere fact that the issue of the open door had been raised with the four allies at the same time while they were struggling for their existence in Europe, gave the contract all the ear-marks of an attempt to create friction between America and the Allies, and so redound to the diplomatic advantage of Germany. I reasoned with the contractors, and told them the lines specified would never be built. I placed the facts before Minister Reinsch and was informed by him that "everything had been most carefully considered in advance." When two months later, on the publication of the terms of the final agreement signed on September 27, 1916, the state department declared that it had no official knowledge of the contract, it placed the responsibility squarely up to Peking, and indicated that Minister Reinsch had concealed the facts for four months from the state department in order that the government would have to face the issue. I saw that it would be impossible to support such activities, and as my usefullness with the Chinese in solving their railway problems had been terminated, I determined to leave China and concentrate my efforts towards bringing about international co-operation to avoid more serious complications. The protests of the Russian, Japanese, British (and the subsequent attitude of the French towards the Siems-Carey contracts) told me that the only way left open for American capital to enter China, during the period of the war, was through co-operation with other powers.

I explained my ideas carefully to Sir Bielby Alston, British Chargé, at Peking and to my Chinese friends, who approved of them, and then visited Tokyo to ascertain the attitude of the Japanese government towards such co-operation. Here I was informed by Baron Motono, through Mr. Inouye (now governor of the Bank of Japan), that as Japan held special political and other interests in Manchuria, the Japanese government could not approve of any international scheme, which, although proposed in the utmost good-faith, might conceal a revival of the Knox neutralization plan. They recognized, however, that they had no special rights or position in China proper, and would not oppose any plan for American co-operation in concessions held by their allies, in fact, they thought that cooperation at such a time would strengthen the morale of the Allies. The Japanese, on the other hand, welcomed American co-operation in the development of Manchuria in order that the two nations might work in harmony in this sphere and dispel all causes for misunderstandings.

I then proceeded across Siberia and after an interview with the officials of the Russian foreign office on their position in Mongolia, arrived in due time in London, and later in Paris. In both capitals I fully explained my ideas on co-operation to the leading bankers interested in China and to the officials of the foreign offices. These views were received with great sympathy and approval with the expression of hope that American cooperation with Britain and France in China could be brought about as soon as possible in order to consolidate mutual interests and policies in that country. Both the British and French foreign office officials with whom I conversed, were deeply solicitous in those darkest days of the war, about the trend of American activities in China, which seemed to indicate an intention to raise issues at a time when neither country was in a position to properly defend its rights. Any plan of co-operation in China that would bring America into line with them, would receive their cordial support. With these assurances, I hastened to the United States, arriving two days after the declaration of war with Germany. I laid my plans and ideas before Secretary Lansing, and at the latter's request embodied them in a memorandum. This memorandum follows, and it will be seen that the plan therein outlined, subsequently served as the basis for the new consortium, but expanded in order to meet the new situation arising out of Japanese military activities in China.

For a better understanding of the following memorandum, I might state that when the Japanese presented the twenty one demands to the president of China in January, 1915, Mr. W. H. Donald, then editor of THE FAR EASTERN REVIEW, residing in Peking, was requested by the Chinese authorities to undertake the publicity campaign that would disclose to the world the full import and extent of this *demarche*, and it devolved upon myself to take charge of this work in America while Mr. Donald remained at Peking in direct touch with events. When China found that she had to accept Japan's ultimatum and sign the treaties, I received a lengthy telegram at Washington from Peking, requesting me to see the secretary of state and obtain his promise that the American government at the expiration of the war, either at the peace conference or a separate international convention to be called for that purpose would have the whole question of China brought before the world, in order that her case could be fully presented. Mr. Lansing, in effect, informed me that this was the policy of the administration and gave me permission to so inform Mr. Sha Kia-fu, the Chinese minister at Washington for the information of his government. Later on, in July of the following year when the Russo-Japanese alliance was announced ; in August of the same year, in connection with the further demands of Japan upon China arising of the Chenchiatun incident, and once more in October when the Siems-Carey contracts were protested by the powers, the state department publicly declared its intention to refrain from facing any Far Eastern issues, until the termination of the war, when, at the peace conference or at another special convention, the whole case of China would be taken up and her status defined for all time. With an intimate knowledge of these declarations always before me, I assumed that the administration really had a fixed policy, which explains that part of the memorandum advocating a *temporary* solution of China's problems pending their final adjustment at the peace conference.

MEMORANDUM

A TEMPORARY SOLUTION OF CHINA'S RAILWAY PROBLEMS

Submitted to the Honorable Secretary of State, June 23rd, 1917.

I beg to submit the following suggestions for a temporary solution of these problems, pending a final decision as to the status of China at the *post bellum* peace conference.

You are familiar with the details of the present international political tangle in China precipitated by the American railway contract which raised the issue of the "open door" with the four allies—Great Britain, France, Russia and Japan—at the same time, and you will sense the fact, that notwithstanding the unquestioned purity of motives on the part of the American company, the allies have good reason to suspect that the issue was raised for the purpose of complicating the international political situation. As the state department has publicly placed itself on record that for over four months, it had no official knowledge of the details of this contract, this throws the responsibility for raising the issue upon the officials of the American company.

Such being the case, it should be reasonably apparent that our allies will not be disposed to hold any great friendship for those who precipitated the issue, and, although they have to depend upon us for financial and other support at this time and are reluctant to criticize, it is logical to suppose that they will passively, at least, oppose any further muddling of the situation in China by the selection of other railway lines for Americans to finance and construct, until a disposition to find an amicable solution is mainfested.

The situation at present is that the American contractors having simultaneously raised the issue with the four allies, and having seen their original five lines protested and cancelled, are now negotiating with the Chinese to obtain in substitution and in conformity with the terms of their contract, other profitable lines for exploitation. Obviously, the only lines they will be permitted to select, are what the other powers designate as "buffer lines," or lines between spheres, beginning nowhere and ending nowhere, and whose acceptance by the Americans can only tend to further complicate the situation, by emphasizing the "Spheres of Influence," which, in the end, must embarrass the American government in defending its traditional policy of the "open door." In plain words, the American company will not be permitted to select profitable lines to supercede those that were protested, and, after the refusal of the American government to support the lines originally specified, the Chinese authorities will hardly dare to concede others which may result in further protests at this time.

The situation is further complicated by the fact that the American company has received terms which make it impossible for the European concession holders to finance their own contracts in America. Although the terms are equitable and the contractor is fully justified in asking for and obtaining every legitimate profit as a business proposition, a situation has been created which now calls for a complete revision of China's outstanding railway contracts, covering the construction of 10,000 miles of lines and involving foreign loans aggregating $700,000,000, and incidentally imposing an additional burden of many millions on the Chinese taxpayer. The only possible manner in which these new railways can now be financed lies in the extension of the American terms to all the other contracts, thus conceding terms to the Europeans, which will leave sufficient margin of profit to enable them to raise the funds in the American financial market. As the Chinese government is already compromised to concede the most favorable terms to new German and Japanese lines, the other interested powers, must, in self-defense, and when the time is opportune, demand the extension of the same terms to cover their own contracts.

The situation, then, is this: The American contract precipitated the issue of the "open door" with the four allies at the same time; Great Britain, France, Russia and Japan incline to the belief that it was a German trap, into which the Americans walked with their eyes open; the official European concession-holders cannot finance their contracts in America unless conceded the same terms as the Americans, or better; they are not willing that the American company be permitted to further complicate the situation by selecting other lines; the Chinese authorities will not dare specify other lines which traverse the so-called spheres of special interest; the allies are estopped from openly voicing disapproval at this critical time because of their dependence upon us for financial and moral support in the conduct of the war; they are naturally disinclined to seek or accept terms from any official financial combination, and would rather have the problem approached as a whole so that an amicable solution can be found, acceptable to all interested parties.

The European financiers must rely upon American co-operation to comply with their contracts in China, and to do this, must receive terms equal to the American contract to enable them to obtain this financial support upon a business basis. As long as no effort is made to find a common ground for co-operation, the interested powers can hardly be expected to surrender what they still consider as their special rights and privileges in their respective spheres, nor is it reasonable to suppose that they will permit the Chinese authorities to select further profitable railway concessions within these spheres for Americans to finance and construct until a satisfactory solution is found.

It must be remembered, that previous to the war, American bankers were unable to float loans in America for the development of Chinese enterprises; and, in various past transactions, the major portion of their participation in these bond issues has been subscribed to by the London and Paris markets. It should also be kept in mind that, rightly or wrongly, the British and French feel that the wealth that has rolled into our coffers since the outbreak of the war represents their life-blood, and that it is this wealth that now enables us to seek concessions in China. Relying on our high sense of honor and justice, they therefore cherish the hope that in any American scheme for co-operation in China, they should have the preference, and, while for obvious reasons, they may not openly voice their disapproval at this time (human nature being very much the same the world over) they must view with deep concern the recent arrangement of an American corporation in co-operating with Japan, while our financiers show no disposition to reach some amicable adjustment with themselves.

If the so-called "Spheres of Influence" in China are to be abolished and American capital permitted free scope to obtain valuable railway concessions in disputed territory, it would seem reasonable to suppose that the other powers will be loath to surrender their pretensions and rights at this time, unless some genuine spirit to co-operate with them is manifested by American financiers.

Exclusive of the American contract for financing and constructing 1,500 miles of railways, the Chinese government has compromised itself to the further construction of 10,000 miles of lines with the other powers, of which approximately 7,000 miles are under contract to British, French and Belgian interests, the loans for which have still to be raised when conditions permit. These 7,000 miles of railways will call for, under pre-war costs, approximately $400,000,000. It is manifestly impossible for this amount to be raised in Europe immediately after the war; and, if the lines are to be built at all, the financing will have to be spread over a period of from ten to fifteen years, calling for an annual installment of from $25,000,000 to $40,000,000 for investement in Chinese government railway bonds. This will probably be as much as the markets can absorb. This total might be materially reduced by the elimination of certain sections of the difficult Belgian lines and brought down to about $300,000,000 and spread over a period of ten years. It would be extremely difficult, if not impossible, to raise such a loan at one time for the development of Chinese railways; besides, it would be unnecessary. It is generally estimated that if a Chinese railway proposition is assured of $5,000,000 a year for construction and other expenses, work can be pushed ahead without any fear of financial difficulties.

This being the case, if we take three British, one French, and one Belgian contract to finance, these will call for an annual investment of $25,000,000 in Chinese government railway bonds for the next ten to twelve years, to see these five propositions through to completion. The question therefore arises: is it not better for the American government to use its good offices with its own financiers and persuade them to guarantee the annual investment of $25,000,000 for the next ten or twelve years in Chinese government railway bonds, so as to permit the British, French and Belgians to comply with their obligations in China? Is it not better to make this safe and conservative investment, rather than face the possibility of further serious complications arising out of these railway concessions in China? In other words, is it not best, for the higher interests of the nation, for the government to recognize the present situation and the drift of events and use its influence to have this sum invested as an insurance against possible war, and so amicably settle the Chinese railway problem in such a way that all can work harmoniously together, and take this ever-recurring irritant out of the scope of dangerous international politics? If a disposition be manifested at this time to co-operate with the others, is it not reasonable to suppose that there will be an immediate breakdown of the "Spheres of Influence," and American capital permitted a clear field in China for profitable railway investments?

It may be urged that this is solving the difficulty with the dollar and unbecoming our dignity as a nation, but against this we must recognize that conditions have changed and our bankers must now take over the financial load that London and Paris carried before the war, and reciprocate and co-operate with the others in China. This co-operation must come as a natural result of changed conditions, and no one combination of American capitalists should be permitted to preserve a financial monopoly in China and dictate the terms to the others in such a delicate international problem.

I have refrained from mentioning co-operation with Japan, taking the reasonable position that Japan has accumulated enough wealth out of the war, to enable her to finance her own undertakings in China. It seems unnecessary also to include Russia, for the reason that the only Russian railway concession in China is purely political and Russia is in no hurry to utilize it at this time, being content to keep it in "cold storage." Therefore, our immediate problem is to find a way to work in harmony with Great Britain, France and Belgium in China proper, and in contracts already entered into, and in which Japan has no direct interest, or reason for objection.

If, at the request of, or with the approval of the state department, a combination of American bankers, should guarantee an annual investment of $25,000,000 in Chinese government railway bonds for the next twelve years, at a reasonable rate of profit to themselves, and so permit our British, French and Belgian allies to carry out their contracts and obligations with the Chinese government and thus preserve their prestige in China, it seems clear, that, in addition to the regular banker's profits on the loans, the American manufacturers would also profit from the sale of materials, pending such time as the industrial establishments of the other countries can be reconstructed.

I feel sure that if the president or the secretary of state should approve such co-operation, the interested powers would at once modify their policies and consent to some broader interpretation of their special agreements with China which now restrict our independent action in the development of Chinese railways. Once there is a return of industrial activity in China, internal conditions will rapidly improve, the people will become more contented, and with employment and prosperity, there will be an end to these periodic domestic troubles which have their real origin in economic disturbances arising from the too acute struggle for existence in a densely populated agricultural country. If China is guaranteed fifteen years of respite from these international intrigues for railway concessions, and the harassed officials relieved of the constant diplomatic contest with other powers over these matters, it will enable the Chinese government to devote its whole time and attention to the reform of other pressing demestic problems, and thus make for stability, internal peace and ultimate strength.

It was this solution that I outlined to the British charge at Peking, and afterwards to the head of the Japanese official banking group (Mr. Inouye, president of the Yokohama Specie Bank) and to the officials of the British foreign office, and M. de Margery in Paris, and which received their endorsement in principle, with an expression of hope on the part of the British and French that this co-operation could be arranged before the expiration of the war, as obviously such co-operation at this time would tend to bind our mutual interests in China more strongly together. The Japanese financial interests after consultation with their foreign office informed me that they could have no objection to any co-operation between American financiers and British and French interests in parts of China outside of Manchuria and Inner Mongolia, where Japan considered she had a special political and commercial position. If such co-operation with British and French interests is not forthcoming, if no attempt is made at this time to solve the problem, how can the people of the United States expect that the governments of Great Britain, and France will wholeheartedly support our present policy in China?

Naturally, if a solution is to be sought, the first move must be made at this end, and a basis found upon which American bankers will consent to raise the annual allottment of $25,000,000 for investment in Chinese railway bonds. This is not a question of issue price or interest, but simply the amount of underwriting profit the bankers will require to handle the bonds. The interest and issue price, especially the latter will be governed by market conditions at the time the various installments of the loans are issued and, after approval by the Chinese government. Once the profit desired by American bankers is determined, and a reasonable profit on the construction of the lines and the purchase of materials is provided for the European concessions holders, the plan must be taken to Peking, and presented to the Chinese parliament, so that they can have the final voice in the revision of the old contracts and decide upon suitable terms for the British, French, Belgian, Japanese and Russian contracts. It being understood that by reason of their special understandings with the Chinese government, the Japanese automatically receive the benefit of the most favorable terms to cover their engagements.

The first step must then be made in the United States, and in my judgement, it is a matter of such extreme importance to the future of American prestige in China, that the arrangements should not be left entirely to financial interests, whose energies are now concentrated on finding lines on which they can start work and issue their own bonds before other loans are placed on the market. It is decidedly a matter in which, for the preservation of American prestige in China, and the best interests of all concerned, the state department is called upon to take action and lead the way, in order to avoid further misinterpretation of our policies.

I make the above statement advisedly, for the reason that the only justification the Chinese have for reviving foreign participation in the profits of state railways is because they were led to believe the United States would protect the lines specified in the contract and defend the "open door" policy. A high Chinese official admitted to me that as the American minister had been instrumental in organizing the new American combination and acted as its sponsor, the Chinese authorities had every good reason to assume that the minister acted under instructions from his government, and the United States would now defend the "open door" policy. It was for this reason, and this alone, that the Chinese were willing to *pay the price* in the terms conceded the Americans, terms which overturned and surrendred the one policy they had consistently adhered to for the past twenty years. To anyone conversant with Chinese politics, it is clear that no official would dare to take upon his own shoulders, without reference to parliament or the wishes of the people, the responsibility of again reviving foreign participation in the profits of government owned railways (a privilege that must now be extended to all) unless he could justify himself before the nation by obtaining some greater compensating benefit. The life of any official who would surrender the vital interests of the nation without receiving some greater advantage for the people would not be worth an hour's purchase.

The cherished state policy has been surrendered, and the terms conceded to Americans must now be extended to all other nations. The Chinese have *paid the price*, but Americans have failed to deliver the goods. Is it fair or honorable for the government of the United States to permit an American company to pocket the price, force the complete revision of all China's railway contracts and open the door for all nations to participate again in the profits and management of China's railways, without the Chinese receiving in return what they paid for, or without the Chinese people being permitted a voice in designing a new railway program? Is it fair or honorable under these circumstances, for the United States government to remain inactive while such a contract is pushed through by an irresponsible official without the people, through their parliament, having a voice in the revision of their railway contracts? If this contract is permitted to go through without reference to the Chinese parliament and the terms extended to all other contracts, and the people are saddled with additional burdens as a consequence, may it not precipitate another revolution, reacting upon all Americans in China? Is the state department willing at this time to permit a situation to endure, which can only result in disastrous consequences to American prestige in China? Are we, at this critical time, willing to permit this situation to develop into a festering sore until the Chinese become inflamed at our indifference to their vital interests, and the progressive masses turn from us as they did in 1905?

For this reason, I contend that the matter is one in which the state department must take the initiative. The prestige of every American in China hinges on the attitude of the government in this matter.

I feel certain that if the state department will take action, the patriotism of our bankers will rise to the occasion, and a way found to assist our allies at this time and so stabilize the situation while preserving intact our traditional policy in China, and demonstrating the friendly interest of our government in China's complex problems.

If the secretary of state will even unofficially signify his approval of the principle underlying the suggestion of co-operation as a solution, the way can be found to take the matter up with the leading bankers of the country, and ascertain their views.

Respectfully
GEO. BRONSON REA.
452 Riverside Drive, New York City.

(I invite attention to the fact that the above memorandum was dated June 23rd, 1917. It pointed a solution to the Chinese railway problems, which the administration, over a year later, accepted, and, with certain modifications, placed into practice. A perusal of the state department's letter of July 9th, 1918, to the American bankers outlining the conditions of the new consortium, and the further memorandum of the department to the British, French and Japanese embassies dated October 8th, 1918, will indicate that the plan outlined in the above memorandum, was adhered to in all essential points, especially in that which recognizes the necessity for the United States to carry for the time being the British and French portions of loans to China. The one feature of the new consortium not provided for was the inclusion of Japan in the partnership and the sharing of our burden by the Japanese group for carrying the other two partners. In this one respect, the department, with its more intimate knowledge of international conditions, was able to round out a finished instrument for a permanent rather than a temporary solution of these problems. It is quite clear, however, that these principles were not accepted, until every other device and strategem was resorted to in order that American capital could break through the sphere of influence doctrine and operate independently in China. Minister Reinsch made a determined fight to carry through an impossible program, but in the end, both he and the department, had to accept the principle of co-operation as the only manner in which American capital could enter the railway construction field in China and eliminate for all time the spheres of special interest. Three times in five years the plans of others for achieving this purpose had been thwarted by the absence of an intelligent policy on the part of the Wilson administration, and only when all other methods proved unavailable did it accept the principle.

In a lengthy interview with the secretary of state, I was informed emphatically that the state department had been maintained in ignorance of the existence of the preliminary Siems-Carey railway contract signed in May, 1916, until the final terms of this contract were made public in Washington on October 1st of the same year. This strengthened my belief that American policy in China was being shaped in Peking without reference to Washington. Refusing to embarrass the administration at such a time with newspaper comments or criticisms, I entered the army. On the signing of the armistice, I resigned in order to accept the invitation of Mr. Yeh Kung-cho (China's minister of communications) to act as secretary to the technical commission attached to the Chinese peace delegation, and advise them on the international political complications surrounding their railway concessions and design a new pooling plan to be presented to the new consortium.

The Chinese technical commission, as well as their peace delegates, were sincerely anxious to meet the new consortium more than half-way, feeling that inasmuch as China needed financial assistance, much delay would be avoided and the dignity and sovereignty of their government upheld, if a suitable scheme for pooling their railways could be presented to the consortium as a basis for arriving at an amicable adjustment of the difficulties involved. They felt that much real progress would be made if the scheme finally accepted emanated from the Chinese government, instead of the consortium devising their own plan and forcing them to accept it. There is little doubt that had their views been considered at that time it would materially have contributed to an early success of the new financial combination, by eliminating all suspicion of its motives. The Chinese stood ready to welcome the consortium with open arms. Unfortunately, however, state department officials then in Paris, had very set ideas as to what they wanted.

I have refrained from making public the Chinese memorandum submitted to the consortium at Paris, which met with the approval of the technical commission and peace delegates as reflecting the desires of their government in readjusting its railway contracts. It was assumed at the outset of the peace conference, in fact, up to the very hour of the Kiaochow decision, that principles so loudly proclaimed during the war would be lived up to. It was assumed that henceforth all political considerations would be eliminated from these railway concessions and they could be approached as simple business propositions. Furthermore, in view of the changed financial conditions and impossibility of carrying the old contracts into execution under the terms prescribed in the loan agreements, it seemed logical to assume that the Chinese government would be permitted to exercise its sovereign power and conceded the choice of one or two procedures. It could demand their cancellation, or, it could do the fair thing and reimburse the bankers for out-of-pocket expenses, or, it could go even further and pay them half the prospective profits in order to regain complete jurisdiction over its future transportation system. With this in view, a rough reorganization plan was drafted, but the idea of purchasing concessions did not appeal to the Chinese, who, at that time, were buoyed up by the hope that President Wilson's ideals would prevail and their sovereign rights recognized under the league of nations. The Kiaochow decision shattered this dream. After careful study the plan was revised to meet this objection.

This plan was submitted to the groups, in the hope that China's wishes might be given consideration at the very outset of the negotiations, and so strengthen the position of its government and relieve it of the implied indignity of having terms forced upon it. It was felt that under the new world dispensation, some practical application would be given to the President's fourteen points and China placed in a position to assert her sovereignty. As most of China's railway concessions were extracted under severe diplomatic pressure, it was felt that under changed conditions, China would have the right to cancel them. If increased terms were to be granted, China was entitled to designate the new national railways for opening up the country. In other words, if the principles heralded far and wide during the war by spokesmen for the allied powers were to be applied, then, China as a sovereign state under the League of Nations, held the whip-hand over her future railway development. If a contract is a contract, then all these old railways would have to be built under the terms agreed upon. If not, and China was approached for new and increased terms, then she would be able to refuse, or exact reciprocatory advantages.

The Chinese position was set forth in the following memorandum :

SUGGESTED PLAN FOR THE POOLING OF CHINESE RAILWAY CONTRACTS UNDER THE NEW CONSORTIUM, FOR THE PURPOSE OF ELIMINATING SPHERES OF INFLUENCE AND RESTORING CHINA'S SOVEREIGNTY OVER FUTURE RAILWAY CONSTRUCTION.

WHEREAS ; the Chinese government has in the past been prohibited from developing a comprehensive and co-ordinated system of state railways, because of the pressure brought to bear by foreign governments for the acquisition of special railway rights and concessions, in which the lines bear no relation to the legitimate transportation needs of China, in fact, in many instances designed to divert or attract the trade of China to adjacent territories or to international treaty ports outside the jurisdiction of the Chinese government, or to delimit or develop so-called spheres of political or commercial influence, and

WHEREAS ; this policy has tended to obstruct and delay the proper development of the natural resources and domestic and foreign trade of the country ; and in addition, by circumscribing the sovereign rights of the Chinese government to link up the remote provinces with the capital, and so impeded the central government and its military and police forces from exercising their proper functions in maintaining internal peace and order essential to the stability of the central authority and to the peace, happiness and general welfare of the people, and

WHEREAS ; a situation has now been created as a result of the war, whereby the holders of railway concessions and contracts are unable to carry out their obligations under the terms of their contracts with the Chinese government, because of the inadequacy of the financial terms and conditions, and

WHEREAS ; it is highly important for the welfare of the Chinese people and the foreign nations interested in the trade and development of China to build new lines of communications opening up the country to commerce and thus resulting in mutual and reciprocal advantages, and

WHEREAS ; the Chinese government recognizing the fact that financial conditions have now changed, and desiring to manifest once more that spirit of justice and equity that has always characterized its business dealings with foreign countries, is disposed, on its own initiative, and as a further proof of its good will and friendship, to grant certain revised financial terms and conditions that will permit the holders of Chinese government railway concessions and contracts to comply with their obligations ; it is therefore suggested, that

(1) The Chinese government will cause to be designed under a mixed commission of expert foreign and Chinese engineers, a comprehensive system of new state or national railways, with a total mileage of 10,000 miles to correspond with the total mileage under contract with foreign interests. This national system will conform to the immediate transportation needs of the country and the requirements of the central government in preserving internal law and order, and will be confined to feasible and profitable lines. This approved scheme will then be made the program for construction until the lines are completed.

(2) All holders of railway concessions will surrender to the Chinese government (or to the consortium) all their rights and pretensions, on the condition that they will receive an equal mileage for construction under the new approved system and revised financial terms.

(3) Those who refuse to pool their interests in the new consortium, or who may be refused admission by the official groups, or, for any other reason, will be given due notice by the Chinese government to comply with their obligations within a specified time under the terms of their contracts, failing which, the Chinese government in the full exercise of its sovereign powers will declare their contracts null and void. The foreign governments to whom the concessionaires owe allegiance will abstain from entering any protest or exerting any pressure on the Chinese government to protect the contracts from being cancelled.

(4) In consideration of the new and revised terms to be conceded by the Chinese government for the carrying out of uncompleted railway contracts, the various foreign governments will abrogate and declare null and void all special railway agreements promises and rights that are in any way incompatible with the dignity and sovereignty of the Chinese government, or its full liberty of action in building railways within its jurisdictional borders. This refers to secret and other agreements entered into between the foreign governments and the government of China circumscribing the latter's authority or granting special privileges to the former ; to the secret and other agreements entered into between the foreign governments or their official financial groups defining or delimiting their respective spheres of railway activities in China, and to such clauses in existing or completed railway loan agreements which operate against China building extensions or branch lines.

(5) On the restoration of full sovereign rights in the matter of future railway construction, which is otherwise provided for in the charter of the league of nations, the Chinese government will enter into a binding agreement with the foreign powers concerned, to refrain from granting further railway contracts or concessions for a stated period of years, or during the time necessary to finance and complete the approved national system. It is understood that Chinese capital will have complete liberty in financing and constructing feeders and branches to the main system, and to be permitted to participate in the construction of the main lines.

(6) The Chinese government will then enter into a contract with the international consortium as called into being by the invitation of the American government, or, with a special international railway financing and construction consortium as the case may be, for the financing and construction of the entire scheme of approved railways. In the proposed consortium, Chinese capital is to be conceded an equal participation in the shares and profits of the construction end.

(7) In view of the fact that the Chinese government has entered into contracts with various American and British interests for the building of railways on a fixed percentage of profits over the costs of financing and construction, and to equalize the conditions of all the contracts under the proposed revised terms, the contract for the approved national system will be of the type known as a percentage contract, in which the Chinese government will pay to the banking consortium, or, to the international financial and construction Company, a fixed percentage of profits over and above the actual costs of financing and construction.

Such a contract may follow the general lines of the similar agreement entered into between the American government and the Philippine Railway Company for the financing and construction of railways in the Philippines, where the company was allowed a fixed profit of fifteen and a half per cent., over the cost of financing and constructing the lines, or, the contracts between the Chinese government and Pauling & Company providing eleven and a half per cent. or that of the Sims-Carey contract, or, preferably, the conditions agreed upon in Paris in 1914 for the financing and construction of 10,000 miles of new railways under an international financing and construction company, in which the lines were to be built and financed for a total profit of thirteen per cent., including Chinese participation in the shares and profits of the construction end.

(8) All the railways contracted for under this scheme will be Chinese government owned and operated lines, built from the proceeds of Chinese government loans, secured by a first mortgage on the physical property and earnings of the lines, and guaranteed as to interest and principal by the general revenues and good faith of the Chinese government.

(9) The usual guarantees for the proper expenditure of the loan funds and the protection of the Chinese government and the bondholders will be given, such as the appointment of engineers, chartered accountants, traffic managers, etc., along the lines of the Pauling contract for the Shasi-Singyfu railway.

(10) To avoid international discord which may reasonably arise if an international organization be designated to construct and supervise any one trunk line, it is suggested that the lines in the general scheme be so apportioned amongst the members of the groups, that each national construction company shall have one complete line to construct and supply with materials. The specifications for the materials for all the lines will conform to a general Chinese government standard to be designed by an expert engineering commission.

(11) This will insure to the manufacturers of each country an equal division in the supply of materials, without having to compete with the manufacturers of all the others. It is entirely conceivable that for the next five years, or perhaps longer, the British and American manufacturers will be in the most favored position to compete for this business to the inevitable dissatisfaction of the French, Belgians or Japanese. It is also conceivable that under anything approaching normal conditions, in any general competition, the Belgian manufacturers would underbid those of other countries. In any attempt to divide the orders for materials on any one line, there is bound to be discord and confusion over the final adjustment. This is the reason why it seems most practical to divide the lines in the general scheme, so that each national construction organization will have full scope for putting into practice their engineering methods without coming into conflict with the others and of having their exclusive market for materials assured

(12) It is also suggested that as a means of facilitating construction and to avoid the losses in interest, etc., surrounding the tieing up of a large loan for any one particular line, and so utilizing to the full advantage the loans that may be annually raised for Chinese railway development, that the annual allottment of railway funds be so apportion that construction can proceed on five lines simultaneously. This will guarantee work and profits for all the national units of the international combination and bring about harmony and friendship, which cannot be accomplished under any other system.

(This suggestion is advanced because in the past, loans for the construction of a complete line have been floated at one time and lain in the banks for several years, or during the progress of construction. It is taken for granted that the average rate of railway construction in China will not exceed 200 miles on any one line annually. As it seems impracticable to attempt to construct a single railway under an international organization, due to the difference in practice and engineering methods, and the conflicts between the engineers and employees of different nationalities, it seems advisable to keep the different nationalities apart in actual construction. The best way would then be to start five lines at once, or sections of five different lines of 200 miles in length that can be financed by the annual allottment of loan funds. If we assume that the new consortium will be able to furnish loans to the extent of 50,000,000 dollars annually over a period of ten years for the purpose of completing the general scheme under contract, instead of floating the loans on the security of any one railway the security could be all the lines

in the general scheme, and the revenues from these pooled for meeting the obligations of the loans. As the general revenues and good faith of the Chinese government guarantees the loan, it seems immaterial whether the loan is raised on the security of one particular line or a group of lines.

(13) In this manner each national participant in the new railway consortium will be able to proceed along lines with which their engineers are familiar without coming into conflict or contact with the others. In other words, the individual lines of the general scheme would be entrusted to one national company to construct and furnish with materials, but would be internationalized and brought under the direction of the consortium through the loan, and after the line is constructed and in operation, in the distribution of the executive posts in the supervision of maintenance, accounts and traffic.

Paris, June 5, 1915.

In effect, this memorandum assumes that the old railway contracts cannot be carried out on pre-war conditions, and the holders must approach the Chinese government for more favorable terms. China said to the consortium and the various governments concerned, "surrender your old contracts, extracted from us by diplomatic pressure in the past, in order that our sovereign rights over our transportation system be fully restored, and then, in gratitude for this simple act of justice, we will invite you to co-operate with us in designing a new national system of railways, and will enter into a contract with the consortium for its financing and construction over a period of years, during which time, we pledge our good faith not to sign any new contracts that may interfere with the successful flotation of the loans required to make your task successful."

In view of the mixed character of her railway agreements, and in order to consolidate all the old contracts under uniform terms, China selected the percentage type of contract along lines similar to the Pauling and Siems-Carey agreements and the American government contract for the Philippine railways which assures that the lines will be constructed economically, efficiently and expeditiously by responsible, reputable and experienced engineers. She furthermore explains that only under some such contract can her capitalists legitimately receive a fair share of the construction profits.

The Chinese proposition deserved better treatment than it received. I am able to state that their ideas were not out of harmony with those of the French and Japanese groups, and although I cannot make such a positive statement in regard to the British attitude, I have reason to believe that they would not be rejected, because of the fact, that the identical principles had been accepted in the international company of 1914, in which the British participant, Pauling & Company, was financed by Erlanger & Company, and the Hongkong & Shanghai Banking Corporation. The opposition to the Chinese proposal, as far as I could learn, emanated from officials of the state department, who reverted to their position of 1914 and denounced the plan as "their old monopoly."

There may have existed other good and excellent reasons to account for the American refusal to consider the Chinese side of the case, pending such time as the political phases of the consortium were clarified by the adherance of the various governments to its principles. It is also easily understandable that the consortium could not function until its internal organization was perfected, but nevertheless, I hold firmly to the belief that a great mistake was committed at the outset by completely ignoring the Chinese memorandum and characterizing their solution as a monopoly, at a time when they cherished the illusion that their sovereign rights were to be firmly established and recognized under the new order of things.

It goes without saying that Mr. Lamont or his American co-workers had little intimate knowledge of the technical phases attached to the Chinese side of the case, their opinion being influenced to a large extent by the advice of others. Naturally enough, the Chinese idea of construction companies or a consortium organized on a basis that would eliminate the financiers and bring in experienced constructors as principals in their railway contracts, was bound to be knifed by those whose interests were opposed to this system. This is simply another phase of the constant warfare between the great construction companies of the world who operate on a percentage or a cost-plus-a-fixed-sum basis, and the adherants to the other system which concentrates all the power under an individual engineer-in-chief, directly responsible to the banks. Both systems have their advocates. The superiority of one over the other is purely a matter of opinion, as a rule most biassed opinion based on self-interest. The Chinese have learned that the engineer-in-chief or departmental system of building railways has many drawbacks and, in 1914, definitely embarked upon a program for building their lines under the other system. It was only natural that a program recognizing the rights of their banks to participate in the issueing of the loans, and their capital to enter into partnership with foreign construction companies would be revived when the opportunity presented, as the same group of officials who sponsored the 1914 program were again in power in 1919.

Consortium leaders are inclined to stress the point that its organization has had the good effect of developing the formation of a group of native bankers for the purpose of co-operating in the issue of internal silver and other loans, but they overlook the very important fact, that in 1914, in the organization of the international construction company, the official British, French and German groups who stood behind their constructors, conceded to the Chinese banks participation in the profits of issueing the loans, the establishment of branches of the Bank of Communications in London, Paris and Berlin with the right to act as depositories for a fair share of the loan funds, as well as the privilege of Chinese capital to participate in the construction profits. That much had been gained for China in the negotiations that were characterized as illegal and in violation of the treaties by Secretary Bryan. The Chinese gained handsome concessions from the European groups at that time, and resented the ignoring of their position when their proposition was turned down in 1919 at the peace conference.

With a knowledge of these facts it is difficult to see where the consortium can take unto itself any undue credit for forcing the Chinese bankers to rely on themselves, or for the tardy recognition of their privilege to participate in future consortium loans to their government. On the other hand it would appear to represent a determined effort on their part to oppose the new consortium for its failure to recognize the concessions gained for them in 1914. For, it must be borne in mind, that the Chinese officials who stood behind the 1914 program, are the same gentlemen who to-day dominate the finances of China through their pre-eminent positions as presidents or large shareholders in the many semi-official banks which form the backbone of the new banking system in China.

The difficulties confronting the consortium at the present time, with an important section of public opinion in the United States declaring that it has outlived its usefullness by reason of the treaties signed at Washington, should compel attention to the facts disclosed in this article. The arguments in favor of its existence overwhelmingly outweigh those in contra, and a supreme effort should be made to conform more to the spirit of the times in recognizing the right of the Chinese to propose some program that may serve to bring harmony out of discord.

Nothing that the consortium can now do will outweigh the results of the Washington conference. The contracts pooled by the various groups are not worth the paper they are written on, if the Chinese determine to hold out for the full exercise of their sovereign rights to dictate how, where and when, their new railways shall be built. This is the crux of the situation. The question of whether the lines are to be built departmentally or under the percentage system is a minor one. The Chinese say to the world, "we want our own national system of railways for the development of our country along lines that will add to our own prosperity, and not that of leased or treaty ports outside the jurisdiction of our government. Surrender your pooled contracts to us, so that our sovereignty over these rights is fully restored; give some practical evidence that the principles you loudly proclaim are to be carried into effect. In return, we will accept the proffered assistance of the consortium to finance and construct a national system of railways equal at least in mileage to the lines surrendered." This is the first step in the program. The question of how the lines are to be constructed, operated and managed are secondary considerations.

It should not be difficult for the consortium leaders to find some solution to this muddle. The last administration failed to understand the Chinese, and it is again up to the practical statesmen of the Harding cabinet to put into practice a policy that their predecessors appropriated from others and were unable to carry into effect.

If there is any sense of justice in the make-up of the present administration at Washington, the rights of the 1914 international construction company in the building of Chinese railways, calls for careful consideration. The former administration not only arbitrarily declared the company illegal and in violation of treaty provisions, but four years later, when it found that its own misdirected activities had effectively closed the door to independent American operations in China, invited the organization of another international combination to supplant it.

The future of the present consortium, as far as the construction of railways is concerned, would seem to lie along lines that will take the solution of the Chinese railway problems out of the hands of bankers and lawyers and hand it over to railway experts. The consortium has faithfully carried out the dictates of the foreign offices. It has proved its worth as a political instrument. The results of the Washington conference however deprives it of any further political significance and provides the opportunity for its critics and enemies to advocate its dissolution. If it is to succeed it must function. If it fails to function it will stand as a monument to the inefficiency of American diplomacy. Harding and Hughes saved the nation from the complete breakdown of our diplomacy in the Far East by calling the last conference. They can save the consortium and our national prestige by similar sensible methods.

The bankers have nobly fulfilled their function by paving the way. Let them now retire gracefully and permit experienced railway constructors to come to the front, complete their work and together divide the honors of success. Let the American group turn to Mr. J. G. White and W. F. Carey, to organize an American railway construction company, a guarantee that American prestige and business honor will be upheld in dealing with the Chinese; let the British group bring about a combination of the Pauling and British and Chinese Corporation interests to act for them in the construction of Chinese railways: let the French group support M. Edouard Gouin, of the Societe Construction des Batignolles, the foremost railway builders of France, and the Japanese get behind a construction company organized from the engineering staff of the South Manchuria Railway Company, with their intimate knowledge of railway construction in China, and then, when these preliminaries are completed, let Mr. Hughes call these experts to sit around a table in Washington with Yeh Kung-cho, C. C. Wang, K. S. Kwong, or other acceptable Chinese representatives. In one or two sittings the deadlock will be broken and a way found to commence construction on the much needed transportation system of China.

The consortium will be there very much in evidence standing behind the construction companies (in which Chinese capital will be admitted to a fair participation), retaining the power, but the detail work handled by men who know their business. The consortium will stand for the purpose of administrative and other development loans, but the railway program will remain outside its immediate control. The British, French and Japanese groups, have, in the past, expressed a desire to be relieved from supervision over Chinese railway construction, prefering to have the constructors act as principals and bear the brunt of settling the many petty technical questions that arise daily in the course of Chinese railway construction.

If the consortium is to function, something should be done without waiting for the Chinese to arrive at the brink of bankruptcy and compelled to accept its terms as the only way to avoid international control over their finances. Good business judgment and wise statesmanship should forsee that under such circumstances, the Chinese will feel dissatisfied and resentful. Harmony and good-feeling is highly essential to the success of the consortium.

I do not hold that the plan outlined is flawless, but imperfect as it is, it recognizes certain important facts that the last administration repeatedly ignored, until their acceptance became compulsory. There is a solution to the consortium problem in the above ideas, and if the bankers will consent to step aside while Secretary Hughes calls into conference the expert railway constructors of the consortium powers and representative Chinese engineers, a way can be found to co-operate with the Chinese in some legitimate manner that will break down their opposition and permit the consortium to function.

GEO. BRONSON REA.

Addis Advocates New Consortium Policy

Negotiations with autonomous provinces of China for the construction of railways rather than the complete suspension of activities on the part of the Chinese consortium because of the present division in the government of that country, is advocated by Sir Charles Addis, chairman of the Hongkong & Shanghai Banking Corporation, director of the Bank of England and head of the British group in the consortium. Sir Charles was the guest of honor and the principal speaker at a luncheon given by Thomas W. Lamont, of J. P. Morgan & Co., at the Downtown Club of New York on March 28.

Sir Charles also believes that despite unsettled conditions in China, which have become a bar to much of the proposed financing by the consortium, there is still the possibility of arranging a comprehensive funding loan for the conversion of the Chinese floating debt. After reviewing some of the troubling conditions which have arisen out of the difficulties between the factions of North and South China, Sir Charles said:

"In the face of all these contradictory compensatory factors what policy ought the consortium pursue? Clearly we cannot take sides in this matter, or support one political party against the other, until we are assured that they are in the way of composing their differences and have the will to unite. I do not think the same objection would lie against a comprehensive funding loan for the conversion of the floating debt, since that would inure to the benefit of all parties, but with that exception the consortium is, for the present at any rate, debarred from undertaking government loans for administrative purposes in China.

"Indeed, I will go further and say that it seems to me unreasonable to hold up the development of communications in China while the government is engaged, it may be for a generation, involving a new political system. In my judgment the time has come for the consortium to consider the practicability of negotiating independently with an autonomous, or group of autonomous provinces for the construction of specific railway undertakings within their respective borders."

Sir Charles expressed optimism concerning a final settlement of China's internal strife. In this connection, he said:

"The process may be slow and tedious and I can understand the impatience of those who would like to accelerate it by placing China under the tutelage of the foreign powers. I can understand that policy, but I am convinced it is a chimera. In the last resort, foreign intervention implies the sanction of force, and the employment of international force in order to coerce China is not a practical policy. China must work out her own salvation. All we can do is to stand by and, in the words of the Washington conference resolution, provide China with the freest and most unembarrassed

opportunity of developing and maintaining for herself an effective central government.

" Such is the instinct for law and order, the capacity for self-government of this extraordinary people, that 1920, the last year, for which figures are available, marked a new record in their foreign trade. Last year's customs revenue was larger than ever before. In spite of the depredations of the tuchuns (military governors), there was a surplus of the salt revenue, after paying all the foreign charges secured in it, of $51,000,000, and the railways showed an estimated free surplus of $24,000,000."

Referring then to the work of the consortium formed in October, 1920, Sir Charles said:

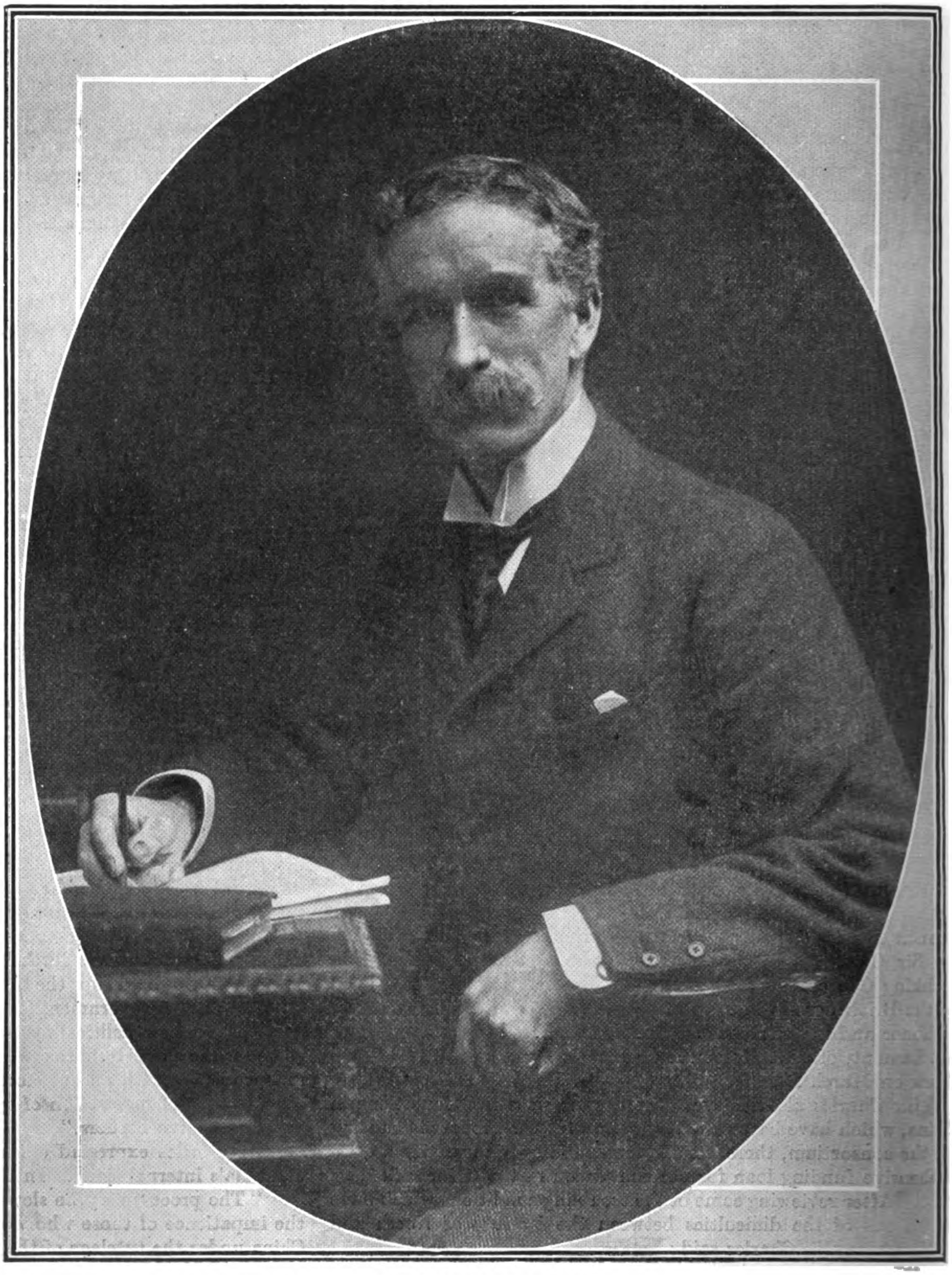
" Consider what the consortium has done, is doing, for the people in China. It has succeeded in establishing an effective check upon the senseless and corrupt government expenditure which was rapidly plunging the country into bankruptcy. I believe I am justified in saying that the profligate borrowings of foreign moneys, which were menacing the integrity of China by a system of insidious financial penetration, has practically ceased since the formation of the new consortium.

" Furthermore, acting on the principle that heaven helps those who help themselves, the consortium has encouraged and developed the formation of a syndicate of native bankers for the purpose of co-operating in the issue of internal silver loans. Apart from its economic justification, in encouraging thrift and utilizing the national savings for national purposes before seeking assistance from abroad, I attach the greatest importance to this movement as a means of giving men with a stake in the country an interest in good government and a strong incentive to work for its rehabilitation.

"It is the bane of Chinese politics, an inheritance from the old *régimé*, that they have been left too much in the hands of the *liberati*. Until we can get the business men, the men with a stake in the country, to join hands with the educated classes, we shall never secure the formation of that sane and sound public opinion, upon which, in the last resort, governments must depend for their power and foreigners for their security."

The continuation of the consortium is a factor of great importance in international affairs, in so far as they are related to the Far East, Sir Charles believes. In reference to this he said: "Drop the consortium and to-morrow the policy of spheres of interest will be revived. That is in the nature of things. Reverse the process by which the co-operation has been substituted for competition and the creditor nations will be forced in self-defense to safeguard the area of their securities.

" There is nothing except the consortium which stands between China and the resumption of spheres of interest, and no one who recalls the international rivalries and jealousies which marked the period, known as the Battle of Concessions, with all its after-



SIR CHARLES ADDIS

For Many Years Chairman of the Court of Directors of the Hongkong and Shanghai Banking Corporation, Director of the Bank of England and Head of the British Group in the Consortium. Unquestionably, the Greatest Authority on Chinese Finances and Railway Problems.

math of territorial aggression and international wrongdoing, will consider almost any sacrifice too great to avert the renewal of such a calamity to China, such a menace to the peace of the world. The consortium has justified itself and will continue to justify itself so long as we stand together. Never were its claims to your consideration and support more insistent, more clamant than they are to-day."

Personalities and Policies Among Chinese Bankers

By Joseph W. Hall

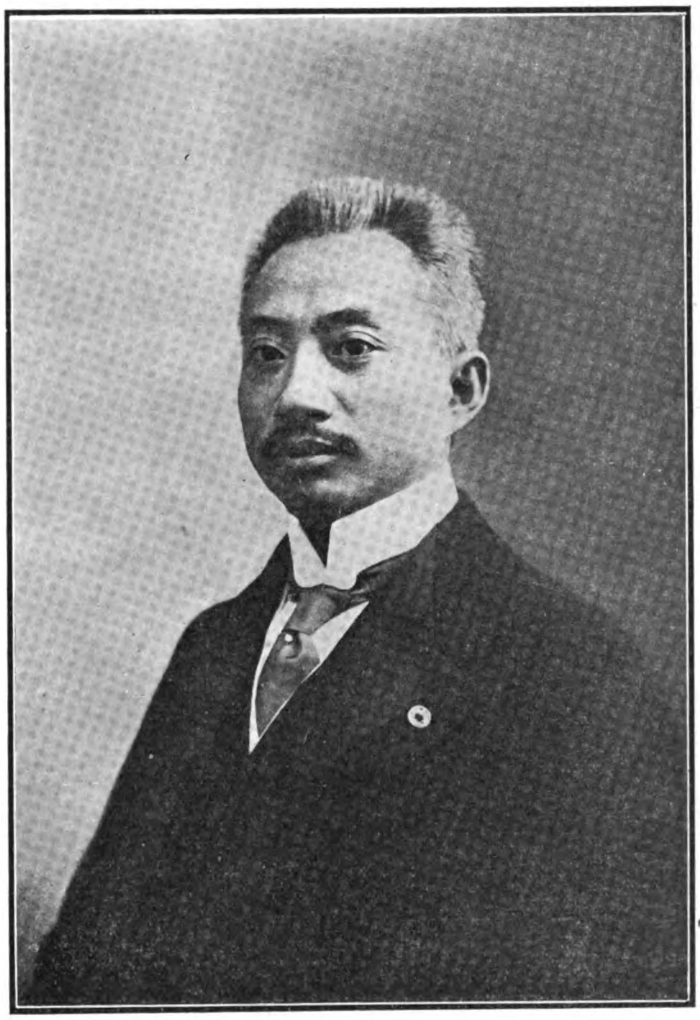
THE joint-stock bank, as developed in Europe and America, is an institution not indigenous to China but which has, since the revolution, taken to her soil in a manner so flourishing as to be almost alarming. It fits in well with the Chinese liking to keep their money in a liquid state, in which they can, so to speak, frequently pass it through their fingers. The high rate of usury pertaining in China and the profit obtained from the various unstandardized currency units makes it possible for the Chinese-controlled bank to operate under the excessively proportioned overhead common to Chinese business and yet show dividends—which indeed average around fifteen per cent. Again, in money-changing, accounting and lending the Chinese have a skill acquired through ages of experiences. There now exist a dozen "native" banks with a paid-in capital ranging from Mexican two to eight million dollars and averaging about three million, and several score more with paid-in capitals of less than two million.

Chinese bankers of the first generation, being unable to cast off the traditions of quick wealth through political power, devoted as much of their attention to the manipulation in their favor of state and federal politics as to the more praiseworthy development of the country's resources and trade. But there is evidence that already among Chinese financial leaders a more progressive generation are rising, who possess higher ideals and sounder economic conceptions, and who are taking upon themselves the burden of improving not only banking but governmental finance as well.

Of the politician type is Liang Shih-yi—because of his spectacular career the most widely-known god of the banking pantheon. Liang's recent short-lived "come-back" into official life, this time at the head of the government, was popularly described by the pun: *Tsai shen tung shen*, or "The god of wealth is becoming active." Although China's "Wealthy Gods" are many, the fortune of Liang has been attained through such boldly speculative means that to him is reserved for nickname *Tsai Shen*—the god of wealth himself—the most-worshipped dicty of the Chinese pantheon, whose image, usually in a glass case, is found in the place of honor in every Chinese shop and over the bed of every merchant.

Mr. Liang's personal appearance and address are in strong contrast to his reputation as a reckless plunger and a political

"THE GOD OF WEALTH"
Liang Shih-yi
China's most daring financial plunger and political adventurer of the Republican Era, who is the dean and leader of the first generation of joint-stock bankers developed in China. Liang has been on leave of absence without resigning longer than any Premier in history.



Tsao Ju-lin
Leader of the New Chiaotung (Railway) Clique, and President of the Bank of Communications.

Mr. Chang Chia-ao

Vice-President of the Bank of China, Father of the Chinese Bankers' Association (commonly called the "Native Consortium" in distinction from the International Group.

Mr. Feng Kun-Kwang

President of the Bank of China.

Mr. Chow Tso-min

Head of the Kincheng Banking Corporation of Tientsin, one of the leaders of the new school or second generation bankers, whose policy is soundness and affiliation with commerce and industry rather than speculation and affiliation with politics and government finance

Mr. Hsu Un-yuan

A Graduate of the University of London, Vice-President of the Chinese-American Bank; the outstanding advocate of financial co-operation with America.

Chow Tsz-chi

Closely identified with Liang Shih-yi in financial matters and large shareholder in many semi-official banks. Minister of Finance in the last Cabinet, and until recently acting premier in the place of Liang. One of China's most astute financiers and promotors.

agent untrammeled by qualms of conscience. He is fifty-two years old, of a retiring disposition, and in an interview or on the platform speaks with an air of extreme humility combined with scholarly culture. Although possessing some knowledge of Japanese he converses only in the mandarin and his native dialect. He is a Cantonese (most of China's financial and commercial leaders are southerners) of a merchant family who are the financers of many silk and produce shops in the southern ports and Shanghai. His first venture following the completion of his classical education, in which he took high honors, was the establishment of various transportation and trading companies for the exchange of peculiar local products between north and south China. In the first year of the republic (1911), as reward for his service in pursuading fellow-provincials to accept Yuan Shih-kai as president, he was made by Yuan acting vice-minister of communications. He had previously held the post of director of railways. Just at this time the struggle between Peking and the provinces for the control of the railways was in progress, and Liang took active part in encouraging the idea of state monopoly of the industry. The great opportunities for wealth to a few men in gathering into their hands the chief railway construction projects of the country did not escape Mr. Liang. With his successor in the office of director of railways, Mr. Yeh Kung-cho, also a Cantonese, he organized a "Railway Association" among the men who comprised the technical and financial management of the government railways of the time. This association saw to it that its members were liberally provided for in all railway concessions and construction projects. Liang also occupied an important position in the Bank of Communications, and so consolidated his hold on that institution that, although he was accused of almost ruining it to finance his chief's monarchical scheme, he maintained himself in the chairmanship of the board of directors. He occupies a director's chair in six other of the native banks which have been promoted in ten years of republican *regimé*.

After Yuan Shih-kai's failure Liang spent some time in Hongkong and some in Japan, where he promoted affiliations with Japanese financiers and statesmen. During this time he engaged in five large, as well as many small, ventures of a wildly speculative nature. His *Hsu Tung* Company, which exported coolies to France and was, after wide-spread protest, suppressed, lost hundreds of thousands of dollars in this venture and in rouble exchange gambling in Harbin. Not only have its shares become worthless but it has large unsecured overdrafts in native banks.

Mr. Liang has been able to maintain his financial prestige to a great degree through the Bank of Communications, in which he controls a large share of the seven-tenths of non-official capitalization and has usually had the support of the three-tenths of official shares, although these have now gone over to Chang Tso-lin. The recent difficulties of the bank, Mr. Liang's personal obligations thereto, and the growing insistence of the "younger set" in the bank, particularly in the branches, on a re-organization along better business lines, which they believe will alone save the institution, greatly threaten Mr. Liang's influence. It is probable that he as well as the class of men of whom he is the most conspicuous representative, will be compelled to retire before the new type of banker being developed at Shanghai, who relies upon modern business rather than political intrigue. The other leading figures of Mr. Liang's class are Mr. Chu Chi-chien, minister of communications under Yuan Shih-kai and confident and recent personal diplomatic emissary of President Hsu Shih-chang; Chow Tze-chi, a sophisticated old Chinese who spent a score or more of years in the consular service in America and returned to become satrap of Shantung and more recently minister of finance; Yeh Kung-cho, railway expert and political intriguer; and Tsao Ju-lin, ex-minister of finance, communications and foreign affairs, a once brilliant figure in Chinese politics who was permanently dimned by the students in 1919. The first two are Liang Shih-yi's chief supporters in his control of the Bank of Communications.

It must not be thought that there exists an open break between the old faction and the new. The cleavage, as all cleavages in China (which is one secret of the westerner's inability to comprehend the country) is not clear-cut. The two sets of financiers are growing apart rather than breaking apart. At present, interlocking directorates and the holding by one bank, of stock of others are the dominant aspects of the Chinese banking world. More and more, however, the "old bankers" find themselves over their depth and compelled to turn their projects over to the new set, just as previously the government departments which founded many of the now existent banks, with the intention that they should be national financial institutions, found themselves over their heads and compelled to turn their projects over to the merchant politicians who have become the old banking clique.

Two influences are operating to put financial enterprise on a sounder basis. First is the urge of contact with modern business: methods felt chiefly at Shanghai; even more convincing is the repeated lesson that success through politico-speculative methods, although apparently more rapid, is ephemeral. The Chinese are by nature conservative. Here is a case where the progressives in spirit are conservatives in method, and they are bound to win.

When the new consortium endeavored to make itself felt in China, Mr. Liang put forth every effort to form a Chinese group, with himself at the head. His endeavor was frustrated by the "new bankers"—as they are popularly called—who refused to place themselves under his leadership. As a countermove the most progressive spirits, such as Chang Chia-ao and Chow Tso-min of Peking and K. P. Chen and K. C. Yeh of Shanghai organized the Chinese bankers' association for financing state enterprises under supervision. This combine has become within the space of a few months the most influential factor in native finance. Borrowing the tenets of the consortium as to close supervision of loan expenditure, it took up the government railways rolling-stock loan for six million silver dollars and soon followed this by another similar advance. The organization is of a sort that agrees with the Chinese genious perfectly, allowing the greatest freedom of action among the members. The plan of operation is of the "Lloyds" type—that is, although the group act together in floating new projects and protecting the interests of members, each particular project is considered and offered to the member banks separately, they being left free to underwrite to the extent to which their ability and inclination dictate.

These bankers, driven to adopt an attitude of hostility to the consortium by the attempt of the foreign groups to ignore them, have c-ooperated with the "old-line" faction of Liang Shih-yi to make the consortium as at present constituted forever unworkable in China. They have, however, been the first to recommend to their government the utilization of foreign capital in developing resources and state enterprises provided the same can be procured on terms acceptable to the Chinese people. This means that foreign money must wholly abandon the idea of security through available diplomatic pressure of its government upon the Chinese government. It means that all political aspects of the coming of such money to China must be negotiated through the Chinese bankers, who insist, with the backing of the people at large, on being the middleman between their government and foreign capital. It does not mean that the capitalists will be unable to procure the utilization of foreign technical experts as an assurance of efficient use of loan funds, but it does spell the death of the type of financing which has prevailed in China during the halcyon days of the concessionaire.

It means that there will be no future security for any investment other than its value as a business proposition. There are indications that at least one dominant group in the new consortium, is willing to recognize, and conform to, the new situation.

The "New Bankers" have shown their spirit by establishing bankers' clubs in Shanghai, Canton, Hankow, Tientsin and Peking; and publishing a weekly review in Shanghai and monthly magazine in Peking professing to be "devoted to economic, financial and commercial topics and banking practices in China." The Peking group naturally specialize in government finance, and are endeavoring to force business methods, for the sake of self-profit as well as

altruism, upon the ministry of finance; while the Shanghai, and to a lesser degree the Hankow, Tientsin and Canton groups, specialize in exchange and commercial credits, and general banking business as it is known abroad. There is, by the way, no north and south scism between Chinese bankers, nor between Chinese business men of other types, although, of course, the Canton and Hongkong bankers tend to confine themselves to their respective fields.

The moving spirit among the new set in Peking—and the man mainly responsible for the group loans to the Chinese government, is Mr. Chang Chia-ao—an alert, although somewhat reserved Shanghaiese slightly under middle age, who speaks English well. Of quick decision and convincing argument, he is an able committeeman. He has, through sheer ability, become vice-governor of the Bank of China, and is the active spirit in that institution, working well under the highly respected but passive governor, General Feng Keng-kwang. He is reinforced through his brother in Shanghai.

Marshal Chang Tso-lin

The overlord of Manchuria, who runs his own financial institution, The Bank of the Three Eastern Provinces, reported to hold $30,000,000 of his personal funds. He came recently to the assistance of the Bank of Communications and by reason of his strangle hold on this important institution is the most important financial figure of China.

A man of Mr. Chang's type is Mr. Chow Tso-min, general manager of the King Cheng Banking Corporation which, although only four years old, has attained an enviable reputation for originality and aggressiveness. The head office of Mr. Chow's bank is in Tientsin, now in the fine former Deutsche-Asiatic Bank building. Mr. Chow is a Japanese returned student, as are the majority of the "new bankers." He began his business career with various small trading enterprises, in which he was very successful. Since 1919 he has been the vice-Chairman of the Peking chamber of commerce. Foreign representatives of the consortium have confessed their respect for his business instinct. Messrs. Chang and Chow are the leading representatives of the bankers' association and chamber of commerce, respectively, upon the commission for the tabulation and liquidation of foreign and domestic obligations created by presidential mandate of February 22nd, 1922. This commission is the concrete result of a demand on behalf of the progressive bankers for accurate, complete and convenient statistics as to the present condition of liquidation of the loans contracted though a decade of wild-cat government finance and for a definite program of amortization.

A collaborator of these two men is Mr. Wu Ting-chang, of the Yen-yeh or Salt Commercial Bank, Mr. Wu, who is a native of far away Szechuan, is a former vice-minister of finance. He has, within the four years of its existence, made his bank a powerful influence in the banking community. The head office is housed in a modern building on Hsi Ho Yien, "Bank Street" in the old city of Peking: and eight branches have already been established.

There is associated with the "new bankers" a small but highly respected school which is even more conservative in the matter of speculative enterprise. These bankers go the limit, in refusing all dealings whatsoever with the government. They are a product of Shanghai, which has come to bear toward Peking the natural suspicion of the merchant toward the politician whom he regards as "toiling not, only spinning words." Some of their banks maintain branches in Peking—although as a rule they do not venture beyond the foreign-policed concessions—but these branches are under careful orders to avoid relations with the ministry of finance.

Although it would seem that the active program of the new bankers who are pitching in with bared arms to the task of cleaning the augean stables of government finance is more calculated to help the nation than the policy of those who studiedly avoid this plague-spot, nevertheless the attitude of the "Conservatives" is a valuable balance upon their more enthusiastic contemporaries. Their strict adherance to commercial banking as it is practised in America or England is an assurance to budding Chinese trade and industry and their imported ethics are an excellent example to financiers who lack the restraint of business traditions.

A prominent "Conservative" is Mr. K. C. Yeh (Yeh Ching-hwei) of the National Commercial Bank, Shanghai. This is the dean of "native" banks, having been formed three years before the fall of the dynasty as a financial organ of the Chekiang provincial railways. The disappearance of the Chekiang Railway Company through incorporation into the national government railway administration caused the head office of the bank to be transferred from Hangchow, the capital of that province, to Shanghai. Mr. Yeh, who had gained banking experience in the Ta Ching or Imperial Bank (upon the foundations of which arose the present Bank of China) became head of the institution. Mr. Yeh is a man of retiring although most affable manner, and constant devotion to business. He is sympathetic but always firm. Under his management the National Commercial Bank is establishing an enviable reputation for soundness. One of the striking features of China's "Money josses" is their relative youth. The oldest nation in the world has probably the youngest financial dictators. Few of the bank heads are past forty-five.

A man as aggressive, as Mr. Yeh is quiet, but who has an equal reputation for "safeness" is Mr. K. P. Chen (Chen Kwong-pu) of the Shanghai Commercial and Savings Bank, Limited. Mr. Chen is an American returned student who does not hesitate to use in his old fatherland all the resourceful methods for "putting things across" to which American business men resort. By inventive advertising he has built up what is probably the only real savings bank business among the native banks. But he refuses to allow a cent of his trust funds to go into projects bearing the governmental taint.

Of Mr. Chen's type, but falling slightly behind him in both rigour and vigor is Mr. Swen To-yu, managing director of the Chung Fu Union Bank, with head office in Tientsin. This bank is also making a start in the savings department, but has been most notably successful in exchange business, both domestic and foreign. For several reasons savings banking does not yet flourish in China. If any institution can establish confidence it has no difficulty in procuring all the money which it can capably handle from shareholders and depositors able to supply capital in large lumps. As

long as this condition prevails, and there is felt no need for mobilizing the hoardings of the small merchant and artisan, bankers will not greatly trouble to develop this more complicated form of banking. Nevertheless herein lies a tremendous, untouched field, for Chinese are all savers, and hid away about the hovels of the middle classes and poor are hoardings aggregating fabulous sums. These can be organized to an extent through skilful educative campaigns, but full confidence on the part of their possessors will only come with a stabilization of political and social conditions. It has been repeatedly demonstrated that a gambling scheme will bring out hoardings much quicker than savings-account facilities. The present collapse of aleatory exchanges is giving savings account banking a great setback.

There is another set of Chinese financiers who operate in co-operation with foreign capital, under the recent Chinese laws governing the incorporation of sino-foreign joint-stock firms. The pioneer sino-foreign banks were the Sino-Japanese Exchange Bank of China, capitalized at ten million yen ; and the Chinese-American Bank of Commerce, financed on the American side by the Stone-Wiggin interests, and which has a paid-up capital of U.S. $10,000,000. The leading figures in Sino-Japanese finance are Mr. Lu Tsung-yu, an ex-official ; Mr. Li Shih-wei, an ex-minister of finance who never assumed office ; and Tsao Ju-lin, mentioned above. The outstanding advocate of financial co-operation with American capital is Mr. Hsu En-yuan, a returned student of political as well as business acumen. With him is associated in a more or less honorary capacity. The Honorable Chien Neng-hsun, a former premier.

The phenominal success of these institutions is responsible for a fever of sino-foreign promotion, and two Sino-Italian, one Sino-Scandinavian, and one Sino-British Bank are among the institutions launched within recent months, while numerous others are projected. Commercial and manufacturing companies of all kinds are being formed along the same line. Sino-foreign banks do not as yet, however, constitute a greatly influencing factor in the Chinese financial world. The Chinese-American bank has set a helpful precedent by co-operating with the Native Bankers' Association.

The banking institutions of all the foregoing groups are ambitious to be nation-wide in scope. Their plan is to establish branches first in the busiest treaty-ports and gradually reach out toward the interior, although with the exception of the semi-government Banks of China and Communications, they have not yet gotten beyond the port cities. There are developing in the individual provinces, however, merchant financiers who are working within provincial boundaries for the assemblage and organization of the capital of their particular provinces, the financing of provincial and county governments, construction of public works, and encouragement of local industries, and commerce in local products.

C. K. Yeh
Chairman, National Commercial Bank

The most flourishing development of this sort has taken place in the economically and politically independent province of Szechuan, and the self-assertive province of Shantung. The most highly-respected provincial bank is that founded by the great Szechuan firm of Young Brothers seven years ago. The bank now has branches in the treaty ports and Peking and correspondents abroad, but it exists primarily for the purpose of facilitating Szechuan's trade. Shantung has several growing local banking institutions the most reputable of which is the Shantung Bank, whose credit is better in the province than that of the national government banks.

Chief among the militarists who have turned financiers, is Marshal Chang Tso-lin, high inspecting-general of Manchuria. His Three Eastern Provinces Bank is capitalized at eight million dollars, and is under his direct managment. From this institution, which is reported to hold thirty million dollars to the personal account of the satrap, Chang was able to provide four million dollars in silver to save the Bank of Communications from the threatened collapse caused by the run at the last year end

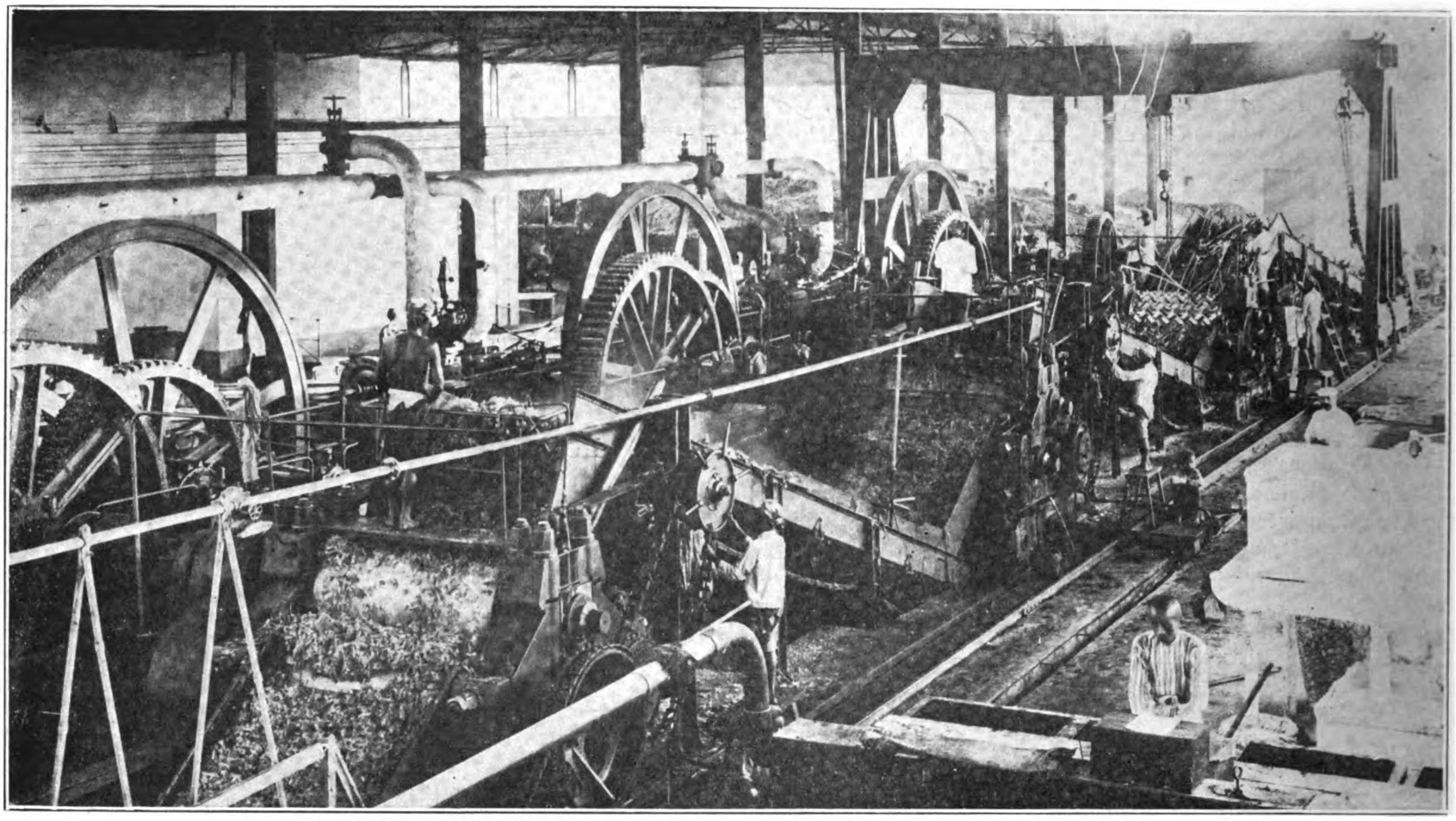
Other militarists whose fortunes give them a place in China's pantheon of wealth are the ex-premier, Chin Yun-peng ; the monarchist Chang Hsun ; the high inspecting commissioner of Chihli, Shantung and Honan, Marshal Tsao Kun ; and the ex-*tuchun* of Hupeh, Wang Chan-yuan—a typical Chinese provincial verres.

There remains one further class of capitalists of whom we may speak in much higher terms. These are the successful pioneer capitalists of the new industrial era which is dawning in China. They are men who have made fortunes by breaking away from the traditional merchantile methods to venture into quantity manufacturing with western machinery. Cotton spinning has thus far proved the most profitable form of manufacture attempted in China. In the Shanghai district a score of men have thereby accumulated sufficient wealth to become factors in the money market. The most picturesque character among them is Chang Chien, a man of determined ideas and ideals—a gentleman of the old school who seeks his country's salvation in the development of her material resources and her industrialization.

Chang Chien and his devoted collaboraters have transformed a piece of swamp land in their native county, one hundred miles up the Yangtze River from Shanghai, into the model manufacturing city of Nantungchow ; he has, through his continued efforts, at last brought the attention of the Peking government to the serious problem of conservancy and port improvement on the Whangpoo and lower Yangtze ; and he is now the key to the barrier which stands in the way of the Seims-Carey grand canal project. But his story is a romance in itself, which we cannot relate here. His chief interest to the subject in hand is the fact that he is founder and principal shareholder of the Hwei Hai Industrial Bank, operating in Shanghai and the cities of the lower Yangtze ; and an important director in the National Commercial Bank described among the "Conservatives" above.

Manufacturing has not progressed so far in China's northern ports as in the Shanghai region : nevertheless the north has produced some pioneer captains of industry. Chief among these is Chow Hsueh-hsi, managing director of the National Industrial Bank of China. Mr. Chow, like Mr. Chang Chien, is a Chinese of the old type, who combines with his circumspect scholarliness a shrewd and aggressive business sense. He received his foreign education in Japan. In the third year of the republic he was minister of finance, and while holding this position projected the Peking waterworks. His enterprises include the largest cotton spinning mills in Tientsin and Tsingtao. He holds a large interest in the British-controlled Kailan Mining Administration, which has a practical monopoly of the coal industry in North China. He is also principal owner of the affiliated Chee Hsin Cement Company, a director of the Bank of China and shareholder in several other banks.

China's newly developing capitalist class is composed of diverse elements. Its smallness compels a good deal of shoulder-rubbings, and a spirit of co-operation for purposes of protection and progress is growing. The sounder and more constructive elements are gradually coming to the fore. This development is earnest that China's government by military adventurers is to give way to government by industrial and financial captains—a decided advance, politically as well as economically.



A typical Java Milling Plant, showing Independent Crusher and two Three Roller Mills

The Java Sugar Industry

By K. R. F. Blokzeijl

THE island of Java is the largest producer of cane sugar in the Far East, it being favored with an especially suitable climate for the cultivation of sugar cane.

The commanding position which the industry at present holds among the producing countries of the world has been secured by an admirable organization for mutual assistance in all directions, above all in regard to research, and by the adoption of methods of cultivation and manufacture on which it would be difficult to improve, carried out under highly-trained and well-paid supervision. The most valuable assistance rendered by the experimental stations which are supported by the planting community, is one of the principal reasons for the progress of the Java sugar industry in the course of time. The agricultural section of these experimental stations consists of one main station and five substations at various districts of the island at which investigations in respect to soils, fertilizers, diseases of canes and varietal tests are made. Besides, there are technical and chemical sections. Every fortnight a report is received from each factory and the figures are carefully controlled, referred to the same basis and put in tabular form for comparison.

The laboratories of the chemical section are fitted with most up-to-date apparatus. There is also a splendid reference library for research work and a museum representing samples of sugar, molasses, cane, etc.

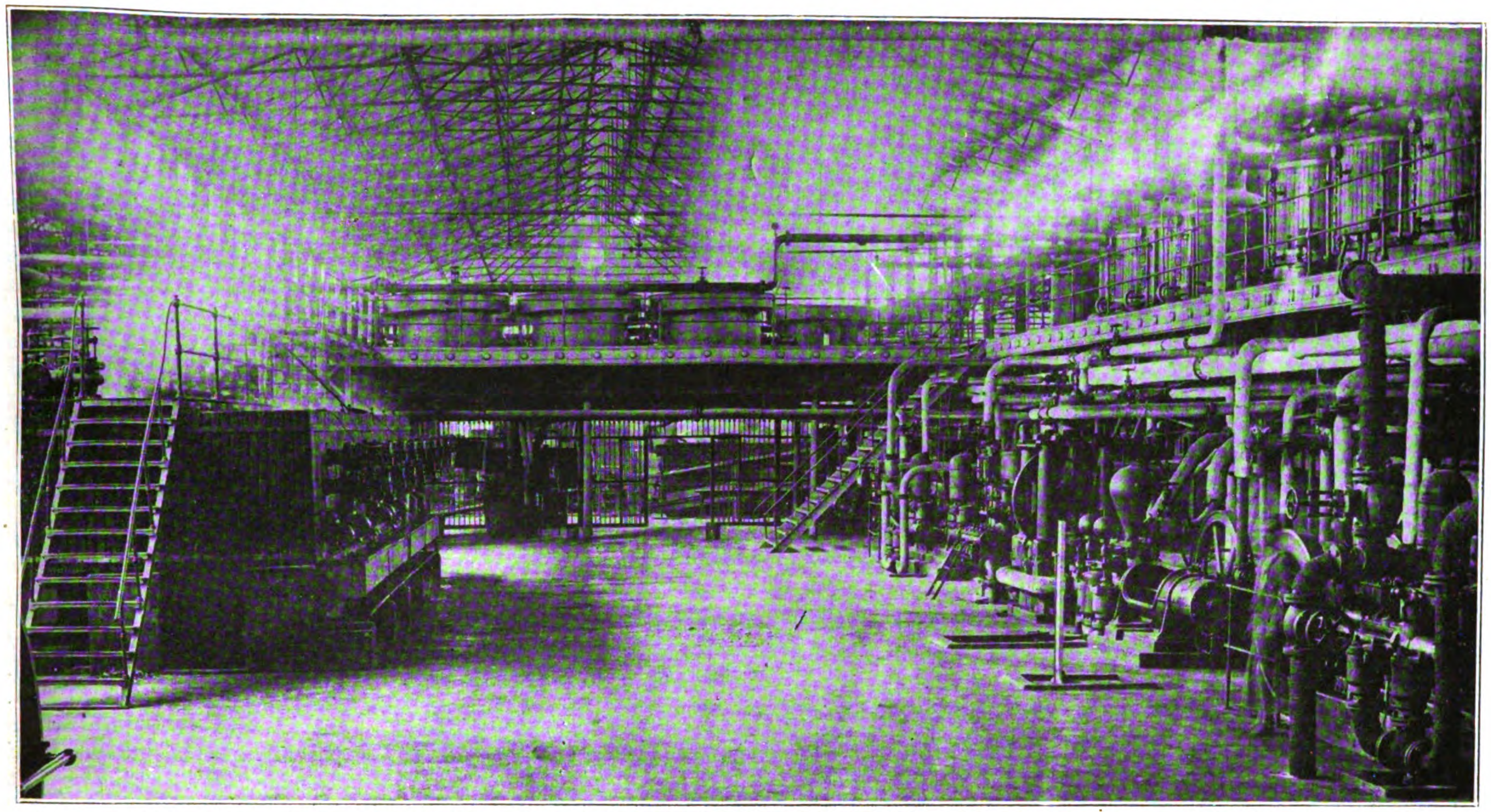
The technical section carries out experiments in the various factories on evaporation, boilers and furnaces, steam economy, etc., in order to try to improve the factories where necessary. All apparatus, such as steam and vacuum gauges, thermometers, meters, etc., are tested and calibrated before being delivered to the factories. It is, for instance, through these investigations that the department has designed a form of furnace which permits the factories to burn additional fuel besides bagasse. Various other improvements have been made by this department, resulting in considerable economy of manufacture.

The sugar factories in Java are found, as a rule, in the densely populated districts in the low-lands, and in most cases it is not difficult to obtain the requisite labor. But during rice harvests, during the construction of great public works, or during an epidemic, labor is occasionally difficult to get. Such cases, however, are not frequent when compared to other sugar-producing countries.

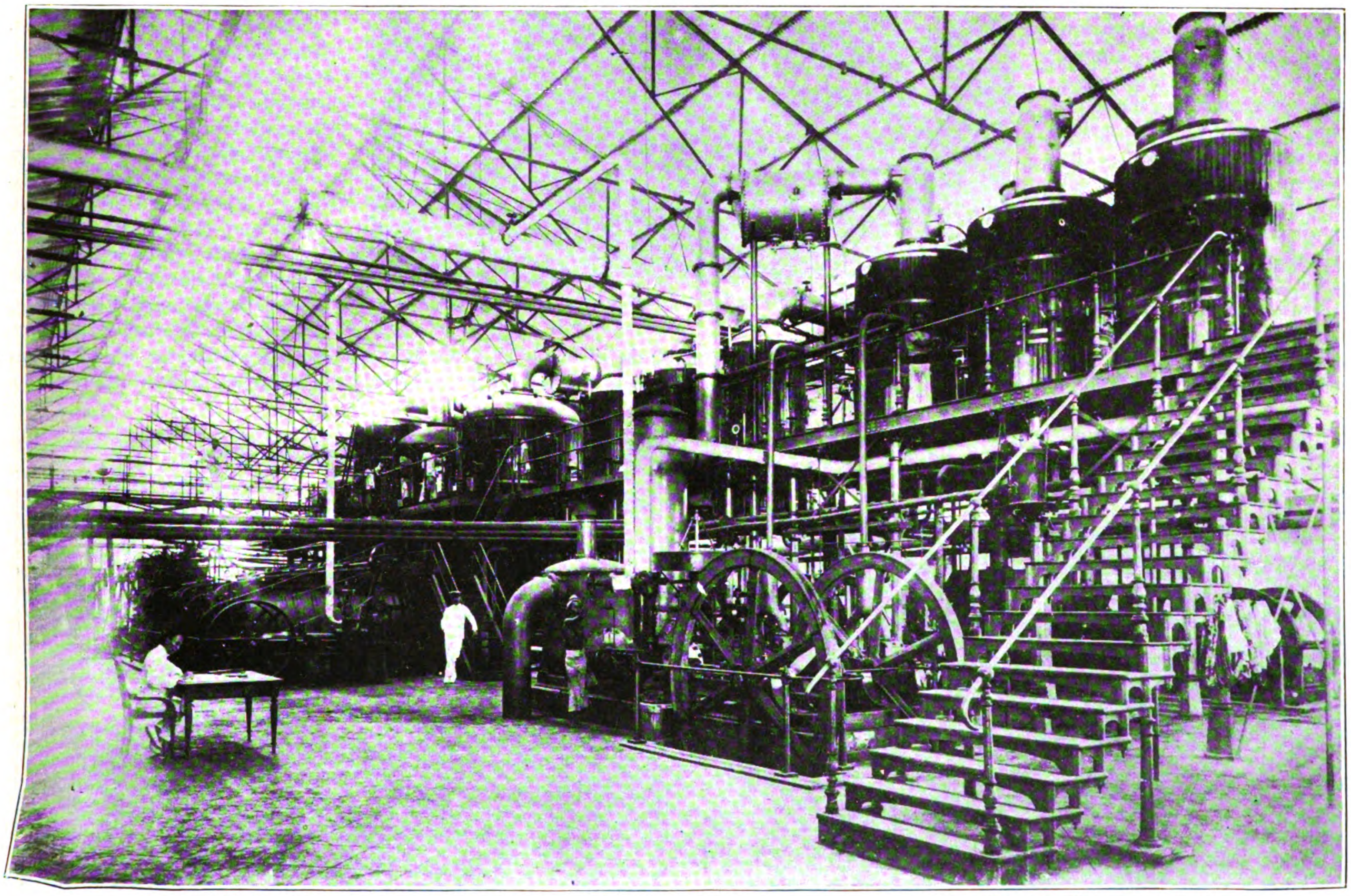
Only free labor is used. The heavy work is done exclusively by men, the light work, such as cutting tops, planting, watering and weeding are in many districts carried out by women. Children are also employed, viz., to destroy insects and to do similar work. The chief condition for a successful cultivation of sugar cane is an abundant rainfall during its growth and a period of interrupted drought during harvest time. Where Java is concerned, the farther one proceeds eastward, the more one may rely on a perfectly dry east-monsoon. Therefore, most of the sugar estates in Java are confined exclusively to the eastern and central parts of the island, that is to say, to the districts east of the line formed by the river Tjimanuk.

The cane requires a period of more than 12 months to ripen; other crops are planted on the same lands in sequence, cane being grown once every three years. The rotation of crops is roughly as follows:

1st year	May till October	Harvest of sugar cane.
	October till November	Soya beans, maize, etc.
	November till April	Rice.
2nd year	April till November	Indigo, tobacco, beans, etc., follow.
	November till April	Rice.
3rd year	April till May/October of the 4th year sugar cane.	



A typical Boiling House of a Java Sugar Mill, showing quadruple effect, Vacuum Pans and Circulating Pumps to the right and Clarifiers in centre.



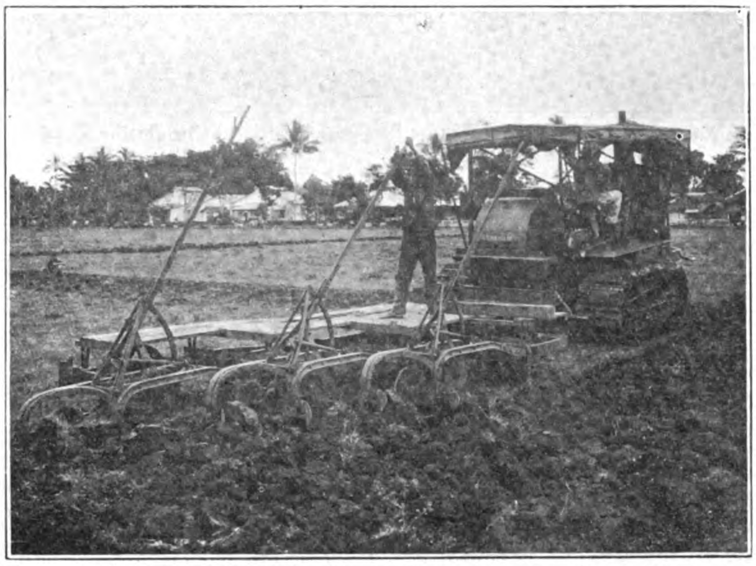
Another Boiling House Installation, showing two sets of Triple Effects, three Vacuum Pans and Vacuum Pumps, the Pans discharging into a Crystallizer Battery. Behind the latter is seen the Centrifugals.

Planting Cane in Java: loosening the soil in the rows, all done by hand

A Young Cane Field

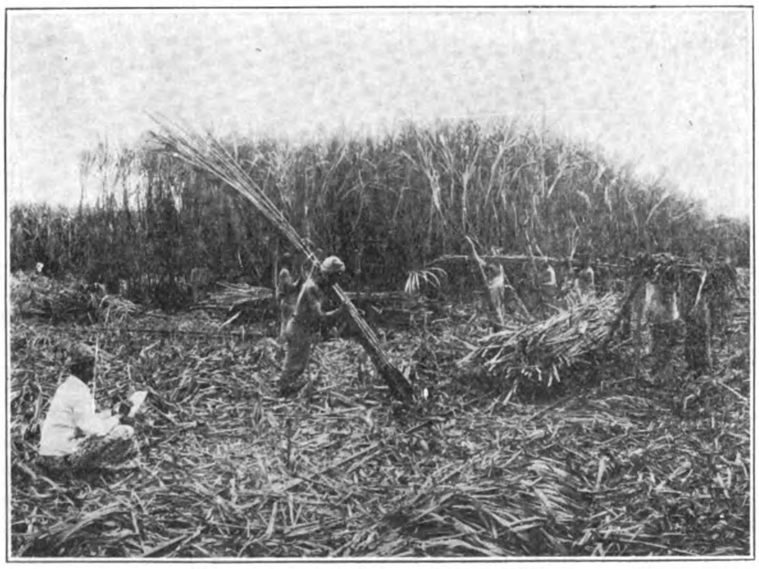
Of the crops being grown between two of sugar cane, the latter alone is cultivated by the European planter, while the other are planted by the native population on their own account and without interference on the part of the sugar manufacturer.

The excellence of the methods of cultivation in use on cane lands in Java has long been recognized. The trench system known as the "Reynoso system" is in general use on all factory lands. Cultivation is still carried out almost entirely by hand labor and little progress has been made up to the present in the adoption of mechanical methods. The first step taken is to construct drains. These are of two kinds, deep drains 2-ft. wide and 1½ to 2-ft. deep, and shallow drains 1-ft. to 1½-ft. deep. The shallow drains run into the deeper ones. Where the land has exceptionally good natural drainage, the deeper drains are dispensed with. On such lands the shallow drains are made 30-ft. apart, but when used in conjunction with deeper drains on land with poor natural drainage they are sometimes closer and may even be only 12 to 15-ft. apart. The larger drains are 120-ft. apart. This procedure results in a highly efficient system of drainage, and without it it would not be possible to grow cane on much of land in Java.

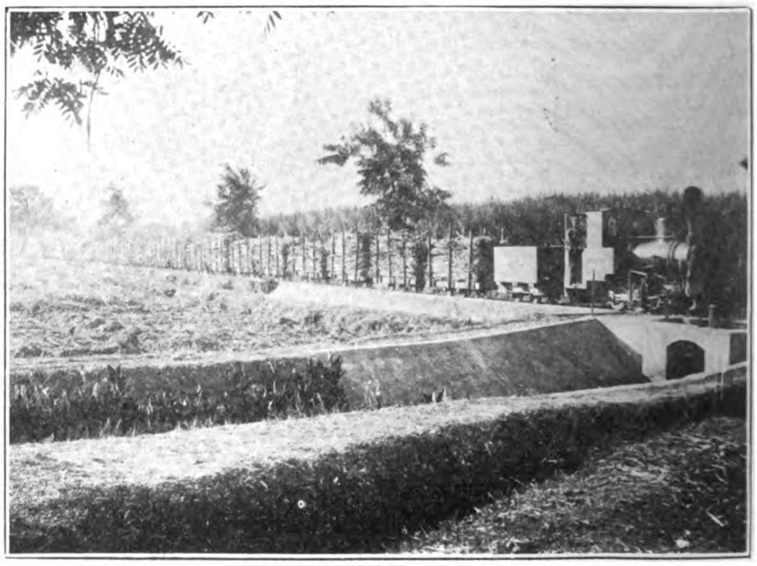


An American Caterpillar Tractor hauling a gang plow in Java

A prominent feature of the cane cultivation is the rapidity with which land is prepared for cane planting. Immediately after the construction of the drains is completed, the making of the trenches is begun. These are made between the smaller drains and are thus 12 to 30-ft. long. The standard dimensions are 4-ft. from centre to centre, 1-ft. deep and a little less than 2-ft. wide. After the trenches are made, the soil at the bottom is dug to a depth of six inches. The trenches are made gradually as the rice crop is removed and no preliminary ploughings are given.

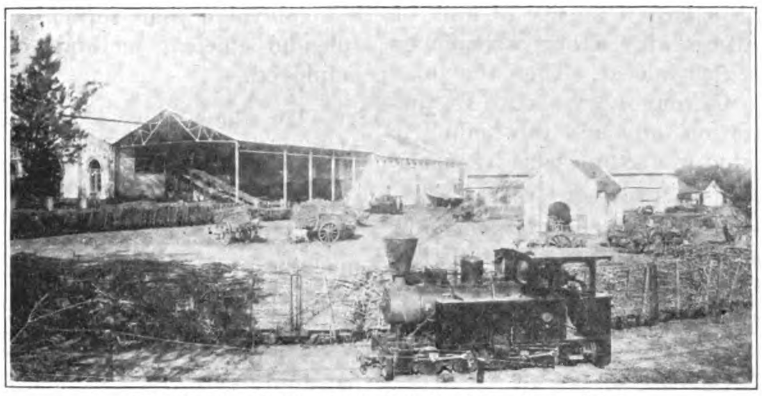


Cane Cutting and Loading on Trucks



Transport of Cane to Mill

The sets are sown some six to eight weeks after the trenches are made and, as a rule, parallel to the sides of the trenches and only a few inches apart. The sets with young shoots are planted in a sloping position. Other sets are planted at a very shallow depth in the trenches and are often not completely covered with soil. As soon as the canes are planted, they are irrigated, the drainage channels being used as irrigation channels. The water requirements of the cane crop have been carefully worked out and cane is consequently grown with the minimum of water necessary. Weeding and shallow cultivation are done as required and, as the young canes grow, the trenches are gradually filled in. The canes are always thoroughly earthed up. This is done in three operations from October to December for canes which are planted in June.



The Batey of one of the Smaller Java Sugar Mills

The usual form of manure is sulphate of ammonia. In some soils which are deficient in phosphorus superphosphate is necessary, but its use is not extensive. Potash salts are not used; this chemical is present in the soil in sufficient quantities.

While the canes are still young, such pests as borer beetles, larvae of beetles and termites have to be caught, but as soon as the last banking is over and the rainy season has made the roads impracticable, all labor ceases. When the dry monsoon has once more returned, the trash is removed from the stalks and soon afterwards harvesting commences.

In the laboratory of the factory the cane is continually being tested, in order to ascertain how far it has matured. Then, when the roads have become dry, the ripest plantations are chosen for cutting. "Cutting" is merely a word, because the cane is dug out as far as the old sets and uprooted as completely as possible, the greatest care being taken to leave as little of the cane as possible in the soil. The adhering earth and roots are then removed and the tops with the green leaves are cut off.

The cane comes into the factory on trucks containing from 6 to 8 tons. These are run alongside the carrier and the contents are hoisted bodily from the trucks by means of an electric crane and deposited on a sloping platform, from which they are fed to the carrier by a rake which is worked mechanically.

The efficiency which, as will be evident from the preceding descriptions, has been brought to bear on the agricultural side of the industry is equally apparent in the factories. The machinery is of the most modern kind and the roominess and cleanliness of the factories conduce to high efficiency.

There are in all 186 sugar factories in Java. Of these the number which submit returns to the research station association varies from 138 to 145, but only 77 to 100 include information regarding engineering work. It is on these returns that the information which follows is based.

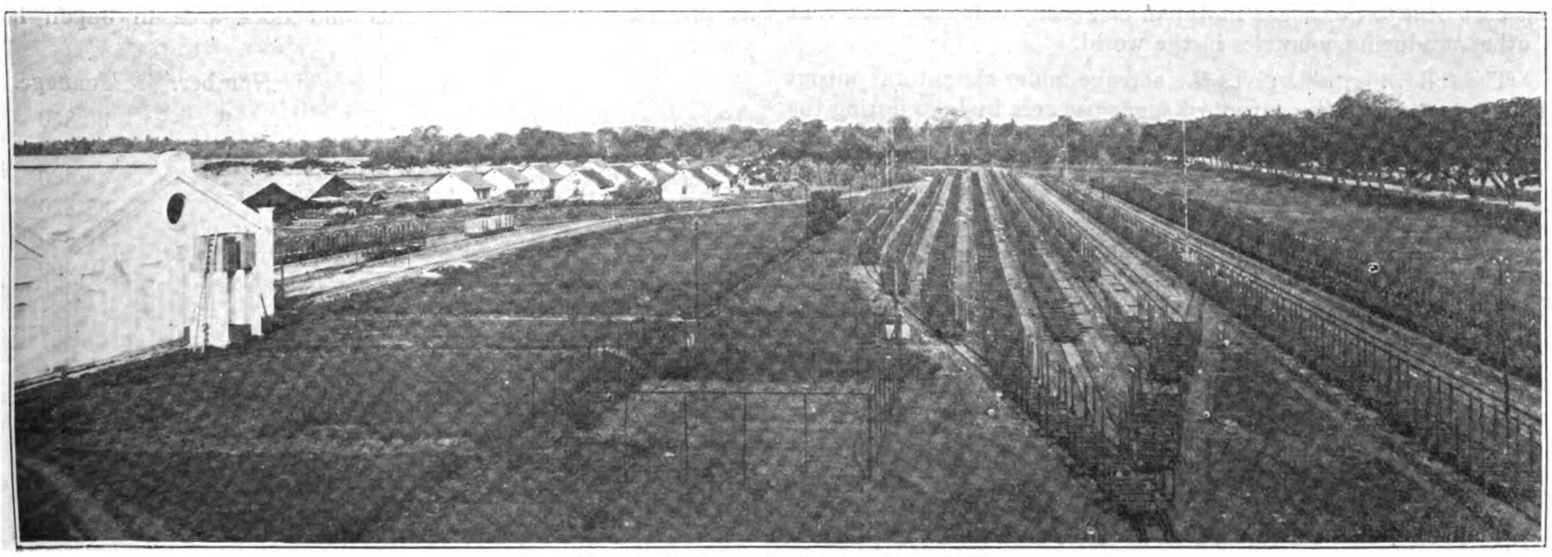
Few of the factories have mills (i.e., steam-driven rollers, between which the cane is caught and pressed) which consist of less than 9 rollers with crushers, or 11 rollers in all, and many have 14 rollers. The figures for the 77 factories referred to above are as follows:

Factories with a crusher and four mills or fourteen rollers in all	8
,, ,, four mills only or twelve rollers in all	11
,, ,, a crusher and three mills or eleven rollers in all	24
,, ,, three mills only or nine rollers in all	33
,, ,, a crusher and two mills or eight rollers in all ..	1

The cane, as a rule, has to pass through three sets of rollers which are placed one behind the other and is drawn from one to the other by means of automatic carriers. The rollers of the second set are placed closer together than those of the first, and those of the third closer than those of the second. By these means nearly all the juice is extracted from the cane. While passing from one set of rollers to the next the bagasse is sprinkled with water in order to dilute the juice still left in it. The diluted liquid is extracted in the next crushing. The residue, which after having passed through the three mills still contains half its own weight in diluted juice, is carried by means of a movable platform to the furnaces and is there used as fuel for the boilers of the steam engines which supply the power for working the factory.

The juice obtained by the process of pressing is freed from all foreign matter by means of strainers and is then mixed with milk of lime and boiled. By this process the liquid is divided into a clear light colored juice and a dark colored one into which the impurities have been participated during the treatment. The clear juice is drawn off, while the sediment is filtered in so-called filter-presses. These apparatus extract a certain amount of clear juice which is added to the first product. The remaining refuse is removed from the factory.

Instead of this simple process a more complicated method is frequently used. According to this, the juice after having been



The up-to-date yard of a Java Sugar Mill

pressed from the cane is mixed with a large quantity of milk of lime and treated at a low temperature with either carbonic or sulphuric acid till the lime is again neutralized. Then the juice is filtered and the cakes of residue thoroughly washed. In this way clear juice is obtained by filtration only and the boiling is obviated. The juice is then evaporated in vacuum pans by means of steam.

The syrup thus obtained is, after having been filtered, boiled in a vacuum in order that the sugar may crystallize. After this has been done the crystals are freed from the adhering molasses by means of centrifugals. These so-called first molasses are again boiled and the remaining sugar is extracted. The remaining exhausted molasses are removed.

A great deal of thought and rouble has been spent in order to link these various processes together and to make them into a harmonious whole. But even now a great deal of care has to be exercised in making preparations for the "campagne," i.e., the milling season, for a hitch or an interruption means a serious loss.

For many years previous to this, a small quantity of white sugar had been manufactured in Java for home consumption, but the production of this article for the purpose of exportation started only in 1903, in which year a shipment of 1,000 tons was sold to British India. The attack on the British Indian market proved a great success, the sugar found ready buyers and very soon Java began to manufacture white sugar in big quantities. This, of course, caused a great revolution in the working of the factories. After experimenting for a short time, they succeeded in producing a faultless white product without incurring greater expense than that which is entailed by the manufacture of muscovado. Java sugar, therefore, became more and more popular in British India and when, in 1911, the German sugar crop failed on account of great drought, white sugar was also shipped to England. The importation of white sugar from Hongkong into British India has almost entirely stopped and it is now only Java and Mauritius which supply the requirements of the great Indian empire so far as its own production is unable to meet the demand. Besides British India, also Japan, Hongkong, Australia, Singapore and several European countries buy Java sugar. The first named buys chiefly white sugar, the others raw sugar and by-products.

The great increase in the production of sugar per unit of area and the improvement of the quality of the article have, of course, not been brought about without the investing of a very large capital. The more intensive cultivation of land, the method of seed supply, the disinfecting, the manuring, the means of transport and locomotion, the machinery for the manufacture itself, the careful surveying and the constant chemical control and scientific investigations have increased the expenses per acre considerably, whereas the wages of the native laborers have, especially during recent years, materially risen. Notwithstanding this, the average first cost of a ton of sugar in Japan can easily compete with that of other producing countries in the world.

The following table gives the acreage under cane, total output of sugar, as well as the output of sugar per acre in Java during the years 1900 to 1920:—

Year.	Acres under cane.	Sugar production in tons	Pounds of sugar per acre.
1900	224,300	732,500	7,380
1905	260,500	1,022,800	8,779
1910	312,600	1,254,600	9,034
1913	360,400	1,436,600	9,006
1916	388,900	1,597,200	9,208
1919	340,100	1,309,400	8,626
1920	385,700	1,513,000	8,834

A fact which is not apparent in studying these figures; but which is still of great importance when judging results, is that the quality of Java sugar has materially improved during the last fifteen years or so, and is at present of much greater commercial value than formerly when the new and expensive, but splendid efficient methods of manufacture were not yet being employed.

The above story of the Java sugar industry would be incomplete without some reference to the fact that this industry proves a real blessing to the island. It gives work to hundreds of thousands of laborers, enables railways and trams to run at a profit, calls to life numerous smaller industries, such as lime kilns, brick works, machinery shops, manufacturies of household articles, and in short spreads a vigorous life over the entire country. One of the great boons is undoubtedly the encouragement given to railways and tramways. For, not only do they connect the centres of supply with those of demand, but the natives are also given a chance of visiting other parts of the country and, by drawing comparisons, learn a great real. The result has been that instead of being content to live in primitive dwellings and to have few wants, we now meet with many natives who have higher aspirations and, what is even better, the means of satisfying them.

For the European, whether he has been born in Java or whether he has immigrated, the sugar industry reaps many a benefit. The 183 factories which were working in 1920 employed over 3,000 Europeans, most of whom are married men with families. They enjoy good salaries, besides, in many cases, receiving in addition yearly gratuities. On account of the fact that successful men retire early and on account of constant vacancies occurring through men going on home-leave, promotion is rapid and there are few professions in which a young man, without money or influence, can so soon reach a lucrative position and in which he may with capacity, zeal and common sense reach the highest ranks without being obliged to invest even the smallest sum. Above all, however, it is necessary to acquire a good education as an agriculturist, an engineer, a chemist or a mechanician.

The figures below show the total exports of Java sugars during recent years:—

	Quantity in metric tons			
	1915	1918	1919	1920
Superior white sugar	1,142,490	1,504,480	1,841,713	1,483,223
Raw sugar	62,546	33,975	19,969	21,643
Molasses	165,696	34,110	132,697	178,153

Japan's shipbuilding industry during 1921 was much more depressed than in 1920. As against 93 ships, of 433,000 tons, built in 1920, only 42 ships, of 217,000 tons, were constructed last year, which is a decrease of 51 in number and 216,000 tons. The following figures show the number and tonnage of ships launched at principal shipbuilding yards and dockyards in Japan last year:—

	Number.	Tonnage.
Osaka Steel Works	9	30,850
Mitsubishi Dockyard	6	43,390
Kawasaki Dockyard	7	44,460
Yokohama Dockyard Co.	5	31,820
Asano Dockyard	3	19,350
Kobe Steel Works	2	10,400
Mitsui Dockyard	2	11,000
Uraga Dockyard	1	2,200
Toba Shipbuilding Yard	1	3,000
Nitta Shipbuilding Yard	1	3,800
Fujinagata Shipbuilding Yard	1	3,750
Uchida Shipbuilding Yard..	1	5,700
Ishikawajima Shipbuilding Yard	1	5,600
Ono Steel Works	1	1,300
Total	42	217,220

River Conservancy in China

By Lawrence Impey, Assoc. M. Inst. Mun. & County Engrs.

Chief Engineer, Sze Tze Kow Conservancy Scheme

IN the year 2297 B.C. occurs the first flood of which the history of China takes note, when the Yellow River or Huang Ho, sometimes known as "China's Sorrow," overflowed its banks with most disastrous results.

The dual rulers of the middle kingdom, Yao and Shun, called into counsel the famous Yu, as being the only person competent to deal with the disaster, and it is recorded that after eight years of unremitting labors, during which he never left his duties for so long a period as to enable him to visit his home and parents, Yu was successful, and the waters were drained off into specially constructed rivers and canals.

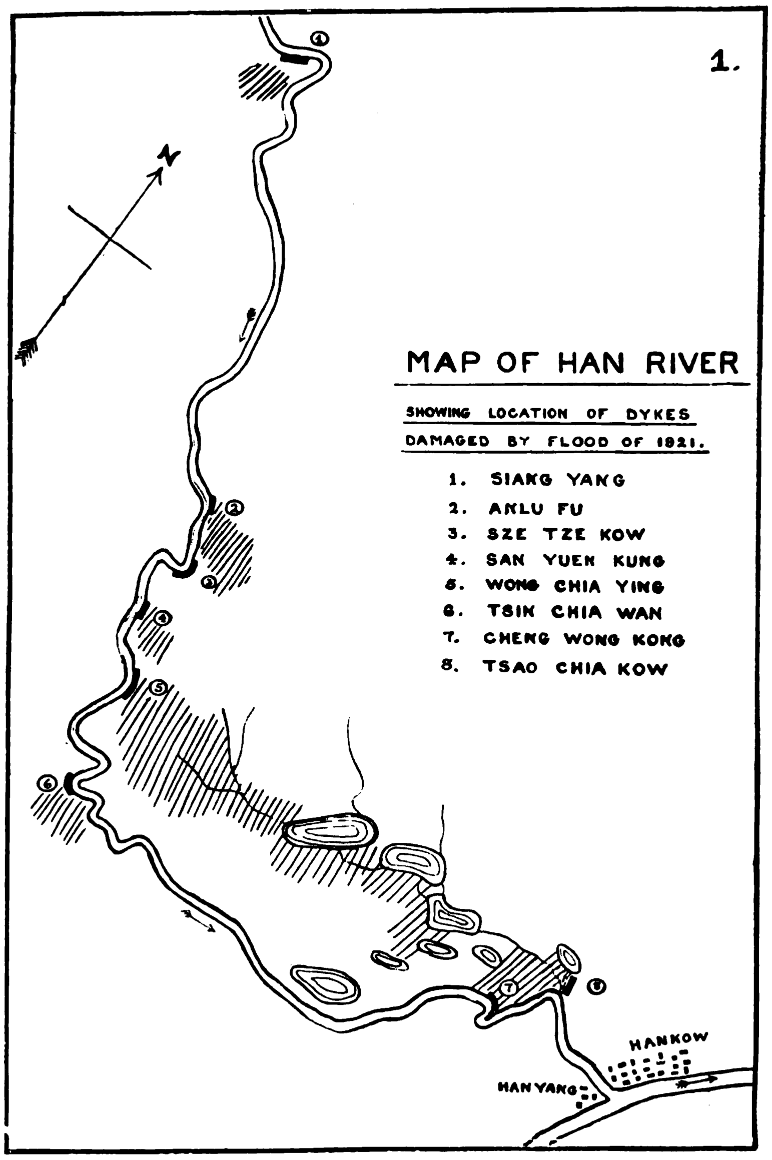
This, I believe, is the first record of conservancy work which history can show, and is certainly one of the finest in its achievements.

From that day to this the history of China has been marred by the record of a succession of floods on the part of the Yellow River, the Yangtze, or the Wei Ho, or the Han River, and it is this question to which I would ask you to give a moment's thought.

For purposes of illustration I propose to deal with the course of the River Han, which flooded the country on both sides of its channel during the autumn of 1921, and with which we are now endeavoring to cope.

The first point to be noticed is the unusual length of the rivers of China, and the consequent volume of water accumulated from their watersheds.

The flooded territory, shown on the accompanying map as shaded area, does not appear so extensive, until it is realized that the distance from the first point at Siang Yang, to the junction of the Han and the Yangtze at Hankow, is a matter of three hundred miles.



Furthermore, the volume of water which caused such distress was accumulated over the whole course of the river, a distance of over two thousand miles, the greater portion of which has been explored by but two or three foreigners at the most, and concerning which no statistics are available.

It should be realized also that owing to the small scale of the map on Sheet 1 it has not been possible to indicate the numerous bends in the course of the river, which has in reality a far more tortuous channel, the boats going up stream pointing their prows first west, then north, then east, and probably west again, which renders navigation by the use of sails a matter of extreme difficulty.

As you can see, by referring to the section on Sheet 2, the water level of the river varies over twenty feet during the rainy season, and the pressure exerted by the increased volume of water is enormous.

Owing to the angles in the channel it often happens that two or three miles of flood water makes a direct assault on some particular portion of the dyke, with what results it is easy to imagine.

In the first place, although the dyke is faced with stone in some places, it has no foundation, with often a very sharp angle of entry to the river, and therefore, even in the less dangerous portions, the damage caused by erosion is very great.

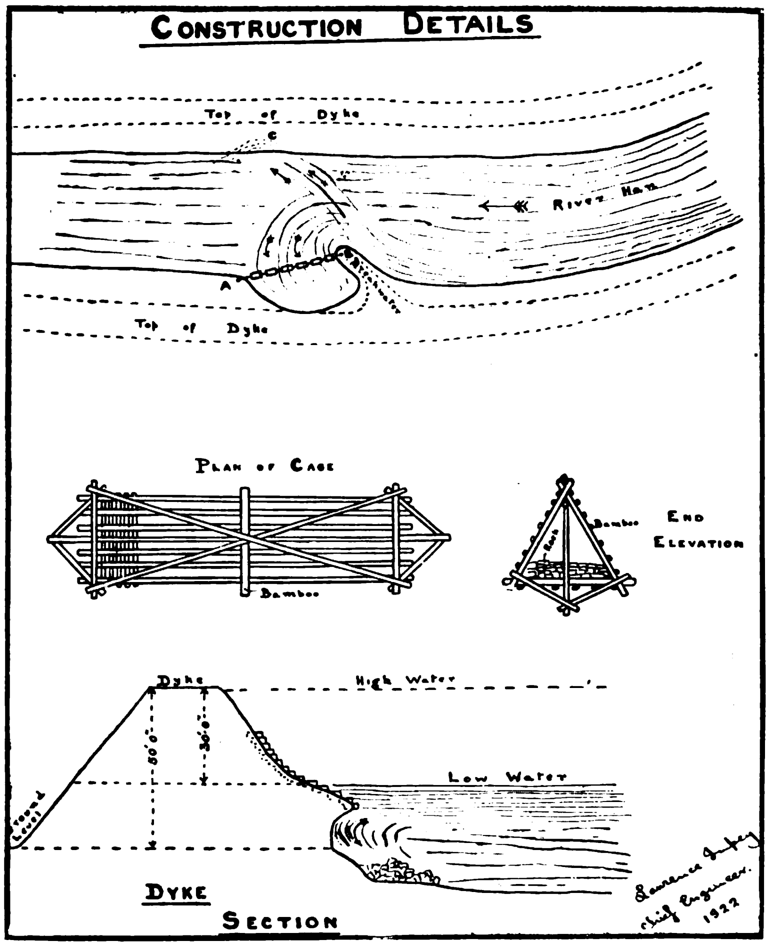
The Chinese of the past few generations have developed a system of so-called 'breakwaters' as shown in the plan on Sheet 2, with the effect which is shown by the arrows on the sketch.

The angle to the current varies from forty-five degrees to a right angle, and the water attacks the opposite shore, washing away large areas of land, and also, forming a curious eddy, destroys the dyke immediately behind the breakwater, as illustrated in the plan, which is drawn from my survey of an actual site.

I am unable to discover why the Chinese are so attached to this form of construction, but from observation of the breaks in various parts of the river, I am unable to see anything to recommend it as an engineering theory.

These remarks apply with equal force to those portions of the Yellow River, the Wei River, and the Yangtze, which I have seen, but I should be only too pleased if any of my readers with greater experience would supplement my suggestions and comments.

The methods which we are adopting will not commend themselves to experts, doubtless, who will cry out at the lack of foundations for construction, and the smallness of the piles, and the absence of cement facing, but I can only say in excuse



that the time and funds at our disposal would not permit of this form of construction.

The piles used are 9-in. in diameter, and from twenty-two to thirty feet in length, placed at two feet centres for spacing, and having a penetration of from fifteen to twenty-two feet.

Stout bamboos are woven between them, as indicated in the diagram on Sheet 3, and behind this retaining wall is placed the broken rock, to a thickness of three feet, and a depth of eight feet.

The piles are tied back by quarter inch wiring, made fast to a base pile some twenty feet in the rear, which is ultimately buried in the earth by the depth of the re-made embankment.

With regard to the bays caused by the breakwaters, which the Chinese at present will not allow to be removed, I am trying a cheap experiment which may overcome the danger, and which I have sketched roughly on Sheet 2.

Bamboo cages are being constructed as shown in the diagram, some twenty feet in length, and with a base width of five feet, the construction being such that ultimately it has a mesh of about an inch.

The theory is that of the permeable breakwaters of Germany and Holland, which permit of the passage of water bearing alluvial deposit, but which slow the current down to such an extent that it is forced to relinquish its burden of soil, with the result that the breakwater gradually silts up.

This method of passing a chain of cages from Station A to Station B is an experiment, as there is very little data available as to the results of such a theory in other countries, if, however, it prevents scouring, it will more than repay its cost.

With regard to the methods of construction work I can only say that they are extremely primitive, which statement I will support with a few illustrations.

The piles are pushed into the muddy bottom of the river by the united efforts of some half-dozen coolies, and when this result has been achieved they then erect a sort of frame on the pile itself, which they slip up to within three feet of the top, and which by some species of miracle remains there, and what is more, supports the gang, who proceed to balance on this precarious platform and with the aid of a circular stone, weighing fifty pounds or so, they pound the said pile into the ground, sinking gradually with it themselves.

Earthwork is paid by the *fong*, or one hundred cubic feet, and the natives bring the dirt to the site in carrying baskets, wheel-barrows, bullock carts, and various other means of conveyance.

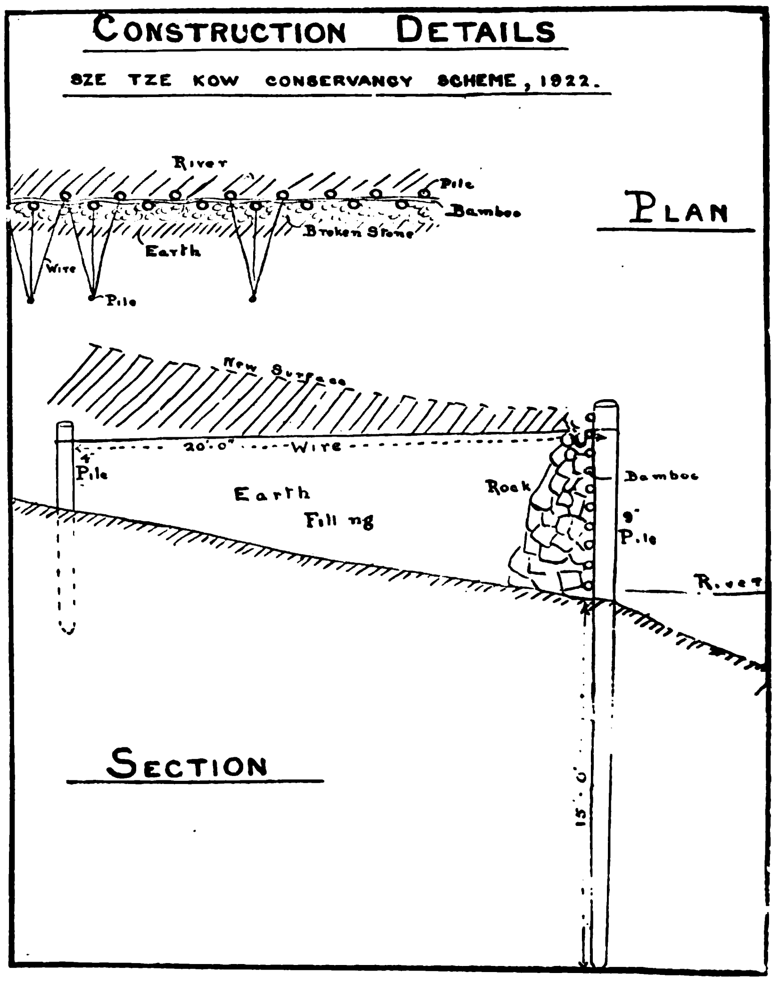
The foreman gives each worker a bamboo slip for the load deposited, and when ten such slips have been accumulated they can be exchanged for another representing that amount of work, until at the end of the day all slips are redeemed in cash.

The cost of driving a pile may be said to average half a dollar each, and the price per *fong* of tamped earth is a little above or below one dollar, according to the distance of haulage.

I estimate that the laborers on our work can earn from three hundred and fifty to four hundred and fifty cash a day, which enables them to live on until the harvest is due, for it must be remembered that most of the labor is famine labor due to the flood, and that in ordinary seasons prices will naturally be higher.

I append hereunder the figures of expenditure on the Han River work this year, allocating each to its particular source :—

International Famine Relief Committee. Grant.	International Famine Relief Committee. Loan.	Local Subscription.	Government Grant.	Location of Work.
$	$	$	$	
	10,000	10,000		Siang Yang.
20,000		40,000		Anul Fu.
50,000			50,000	Sze Tze Kow.
		10,000	20,000	San Yuen Kung.
			1,200,000	Wong Chia Ying.
60,000		40,000		Tsin Chia Wan.
10,000	10,000	20,000		Cheng Wong Kong.
	10,000	10,000		Tsao Chia Kow.
$140,000	$30,000	$130,000	$1,270,000	



With regard to the work at the government section at Wong Chia Ying, after examination of the site, in company with two or three competent engineers, Chinese and otherwise, we came to the conclusion that the work was extremely slipshod, unsound in theory, and so high in cost compared with results as to be out of all proportion.

On further investigation I found that there was no qualified engineer on the work, that there were some twenty different departments, none of whom were collaborating, and some of whom did not seem to be responsible to even one central authority.

The authority was vested in a very estimable odl man, who was very seldom on the spot, as far as I could tell, the recommending factors in his favor were old age, good disposition and vegetarianism; probably he came from the home town of some one in authority.

At all events there was a wonderful system of overseers and foremen, all of them taking a little 'squeeze,' and then delegating the job to others, so that it was almost impossible to discover who was really responsible for any particular piece of work.

The work being undertaken at Tsao Chia Kow varies from the rest, in that it consists of the construction of a canal, to drain some of the flooded areas back into the river, a work which might be very largely extended if funds and time permitted.

In spite of all the repair work which has been and will continue to be done, the river gains ground, and shifts its channel, as do all the other rivers of China, leaving in their wake a desert of sand on which nothing can be grown, and aptly pointing the moral of the title of the Huang Ho, ' China's Sorrow.'

The only real solution of the difficulty lies in the straightening of the channel, and the constant use of dredgers, though it is possible that the narrowing of the limits and direct and rapid course of the river would also achieve the result of scouring the channel, and obviate much of the repair work which is at present necessary.

It is an interesting comment on the importance of river navigation and conservancy work in China, to note that the first conservancy engineer in Chinese history became one of the first emperors of the middle kingdom, one of the famous rulers of the golden age, and the saying attributed to Yu, in which he gives the secret of his success, might well be inscribed in letters of gold, for our modern scientific knowledge can add but little to it :—

" Keep the channel straight and its bottom clear."

Silk Mills in Hangchow

HANGCHOW, the provincial capital of Chekiang, is a famous silk-producing centre with several mills operating along modern lines. The most important of these are:

WAI CHENG.—The Wai Cheng Silk Weaving Factory, Ltd., established in 1912, and registered in the same year with the ministry of agriculture and commerce, under the management of Mr. Chu Kwang-shou. The main factory is situated at Shaw-chi-tang-hong, Hangchow, with a branch which is under construction at Dah-yen-chong-jao, Kashing. The former is divided into six departments, viz.: hand-weaving, design, adjusting, twisting, reeling and dyeing, employing about 1,700 workmen; the latter, when completed, will have four departments, viz.: power-weaving, twisting, adjusting and reeling. The yearly output is valued at over $1,200,-000.

HOO LING.—The Hoo Ling Silk Textile Plant, Ltd., founded in 1912, is located at Poo-chang-hong, Hangchow. The factory has three departments, viz.: weaving, design and adjusting. It employs about 1,300 workmen turning out an annual production of about $700,000 in value. A branch plant, consisting of reeling and twisting departments, has been recently erected. Mr. Tsai Ching-yen, graduate of the Dyeing and Weaving College at Tokyo, is general manager.

YUEN TSENG WOO.—The Yuen Tseng Woo Silk Weaving Factory at Hsiao-foo-ching-hong, Hangchow, was founded many years ago. The factory consists of the winding, twisting, reeling, design and is equipped with 200 looms and employs more than 1,6C0 employees. It is capable of turning out a yearly production valued at $600,000. Mr. Yuen Chiar-tseng is proprieter and manager.

TIEN CHONG.—The Tien Chong Silk Weaving Factory at Pu-chiar-lung, Hangchow, was registered with the ministry of agriculture and commerce in December, 1920. It consists of six different departments, viz.: reeling, winding, weaving, twisting, figuring and power rooms and has 600 employees at work. The production of the factory amounts to about $350,000 in value every year. Mr. Chow Ching-yuen is general manager.

CHING CHENG.—The Ching Cheng Silk Weaving Factory at King-dong-jao, Hangchow, was registered with the ministry of agriculture and commerce in March, 1913. The factory is divided into four departments, viz.: weaving, figuring, winding and dyeing and employs 410 workmen. Its general manager is Mr. Hsu Yih-ching, and its annual output is 4,000 pieces of satin, valued at $240,000.

YU CHONG WEN.—The Yu Chong Wen Silk Weaving Factory in the eastern section of the city was founded and registered at the end of late Ching dynasty, in 1912, 170 modern looms were installed. At present there are 400 employees and its yearly output amounts to $300,000 in value. Mr. Chiu Yih-yung is general manager.

KIU CHEN.—The Kiu Chen Silk Weaving Factory at Wu-foo-liu, Hangchow, was registered with the ministry of agriculture and commerce in 1914, under the management of Mr. Wang Hsiao-ching. It has 130 looms in operation and 370 workmen, producing 4,600 pieces of silk fabrics per year valued at $240,000.

TSENG FOONG.—The Tseng Foong Silk Weaving Factory at Ching-lung-chiar, Hangchow, was registered at the ministry of agriculture and commerce in 1914. There are 120 looms and 330 employees. It produces silk fabrics to a value of about $240,000 every year. Mr. Chen Mow-ching is general manager.

LUNG CHONG.—The Lung Chong Silk Weaving Factory at Hwang-tsoo-yuen-hong, Hangchow, was established in 1917, and is managed by Mr. Kao Pang-nien. It is equipped with forty-two modern looms and employs 180 workmen, with an annual output of about $120,000 in value.

SUI SING.—The Sui Sing Silk Weaving Factory, located at Teng-yuan-jao, Hangchow, was organized in July, 1915. The factory has two departments and employs 180 workmen with an annual output of about $130,000 in value. Mr. Shen Yao-foo is its general manager.

DAH SING.—The Dah Sing Silk Weaving Factory at Chang-ching-chiar, Hangchow, founded in 1915, is run under the direction of Mr. Chen Tze-an. It has about 100 looms in operation, and keeps 180 workmen at work. Its yearly output is approximately $120,000 in value.

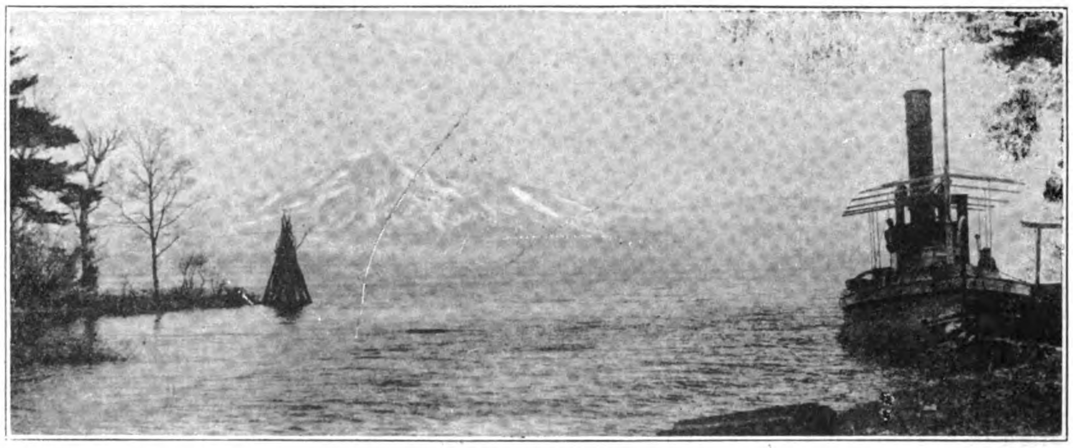
The Japanese Soap Industry

The value of the soap produced in Japan in 1908 amounted to Y.3,040,000. In 1918, ten years later, it attained Y.20,940,000, of which Y.10,490,000 were for toilet soaps. In 1918 Japan had 277 soap factories, employing 2,988 hands. In 1919 there were exported Y.3,000,000 worth of toilet soap and Y.500,000 worth of household soaps, while Y.3,600,000 soap were imported from abroad, chiefly from England and the United States. The requirements of caustic soda and carbonate of soda are covered by the leading Japanese soda-producing districts. English and American sodas are not so dear, however, so that Japanese manufacturers are not clamouring for customs discrimination to be made against them. In 1920 a new soap and candle factory was founded, under the style and title of the "Japan Soap Manufacturing Co."; it will work chiefly for exportation, similar to the already existing "Nippon Glycerine Manufacturing Co."

Japan's "Water Powers"

The Inawashiro Hydro-Electric Power Company, Ltd.

AS far back as 1896, the North-Eastern Electric Power Company and the Japan Hydro-Electric Power Company had been promoted for the purpose of utilizing the flow of the Nippashi River for the generation of electric power, their plans, however, being confined to obtaining water rights on the river itself, overlooking the more important source of power confined within Lake Inawashiro. In 1910, their rights were taken over by the promotors of the Inawashiro Hydro-Electric Power Company, Ltd., after which negotiations were entered into for acquiring the rights of the Asaka Irrigating Association, who obtained in 1878 the privilege of utilizing the waters of Lake Inawashiro for irrigating large tracts of rice lands in Asaka perfecture. With control of the lake as a storage reservoir, the new enterprise was placed on a secure basis, making possible the transmission of power to Tokyo, 140 miles away. In July, 1911, permission was granted by the ministry of communications to proceed with the plans. The first meeting of the shareholders of the new company was held on October 30 of the same year, in which the nominal capital was authorized at Y. 21,000,000, divided into 420,000 shares of Y 50 each. The company then secured the reservoir rights to Lakes Hibara, Onogawa and Akimoto which lie at a higher altitude than Lake Inawashiro, and then obtained rights to the Nagase River which serves as the outlet to the above lakes and empties into Lake Inawashiro.

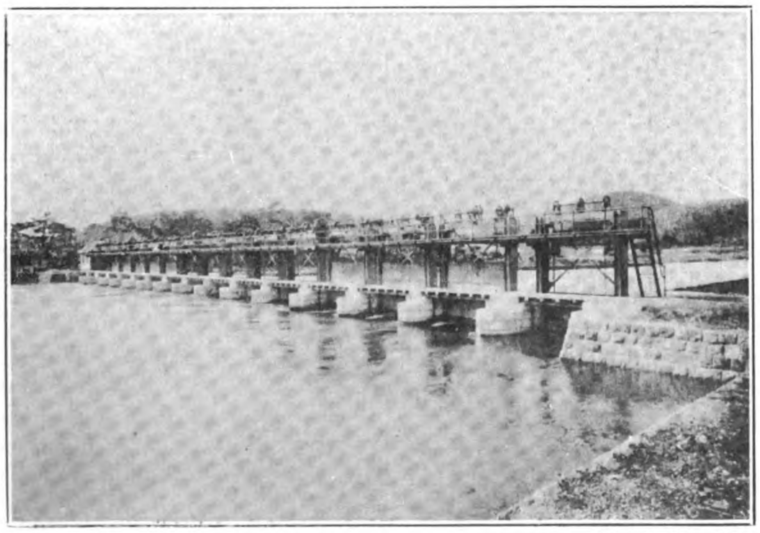


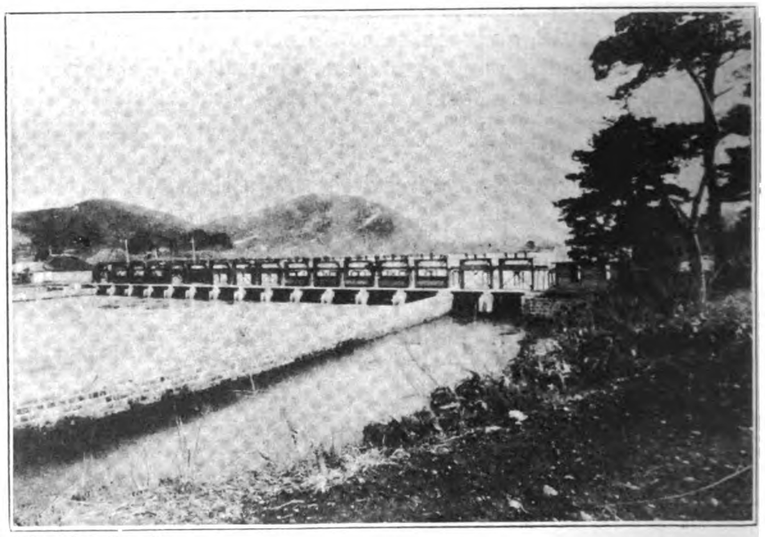
Lake Inawashiro

General Plan

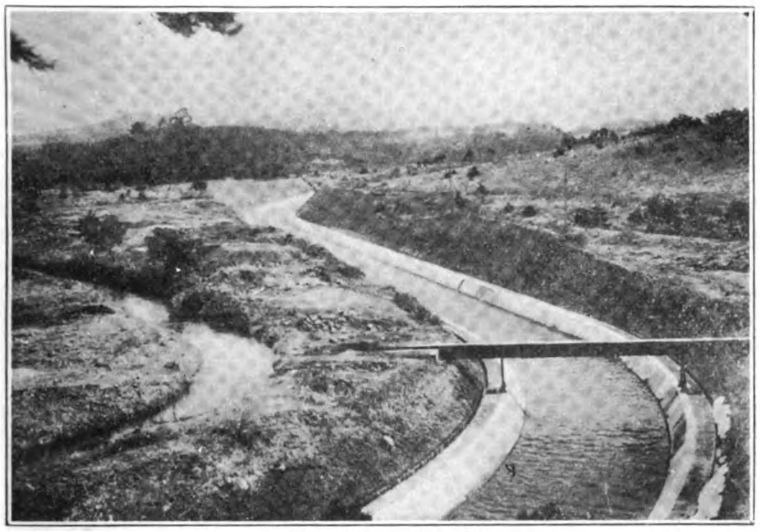
Lake Inawashiro, with nearly 42 square miles of water surface, drains an area of 319 square miles (including the Nagase River and other streams which empty into the lake). It has a depth of 3.2-ft. and a storage capacity of 3,500 million cubic feet. Its elevation is 1,700 feet above sea-level, or 1,000-ft. higher than the plateau of Wakamatsu. The Nippashi River flowing northeast is the only outlet to the lake and its drainage area. In the Wakamatsu plateau it joins the Ara River and empties into the Japan Sea. Four power houses are installed along the Nippashi River. According to the franchise granted by the government the quantity of water flowing normally in the Nippashi River is placed at 1,000 cubic feet per second, but by regulating the flow at the "Juroku-kyo" gates, a maximum flow of 1,600 cubic feet per second can be obtained, corresponding to a peak load of 62.5 per cent. load factor. Several irrigating canals located between power houses three and four decreases somewhat the quantity of water available for these plants.

Above Lake Inawashiro, are located three lakes, Hibara, Onogawa and Akimoto, connected by the Nagase River, and emptying into the larger lake. Lake Hibara with an elevation of 2,700-ft., has an area of about 4.1 square miles, draining a watershed of about 40 square miles. Its depth is about 43-ft. and its storage capacity about 4,200 million cubic feet. Lake Onogawa, is 2,620-ft. above sea-level, 0.6 square miles in area, draining about 55 square miles of territory, including that of Lake Hibara. Its depth is 29-ft. and its storage capacity,330 million cubic feet. There is a difference of 230-ft. in elevation between this lake and the next lake, Akimoto. Utilizing these two lakes as reservoirs, the Onogawa power house is to be installed. It is calculated that the maximum and mean yearly flow of water through this power house will be at least 485 and 315 cubic feet per second, respectively, the load factor being assumed as 65 per cent.

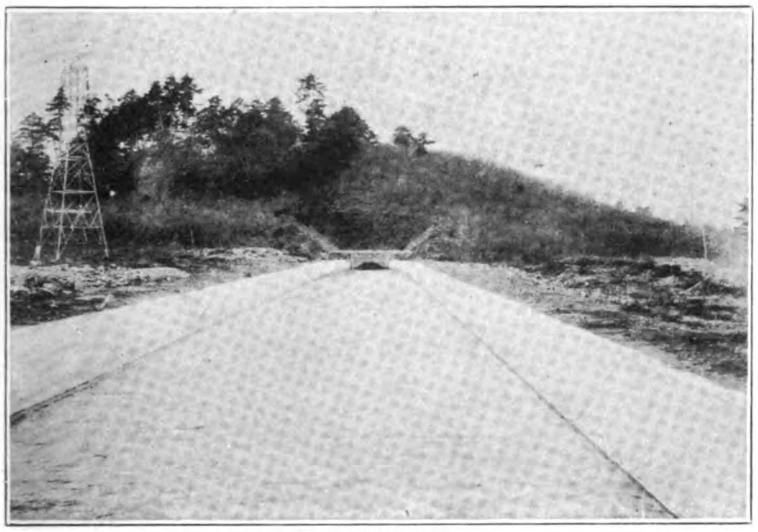


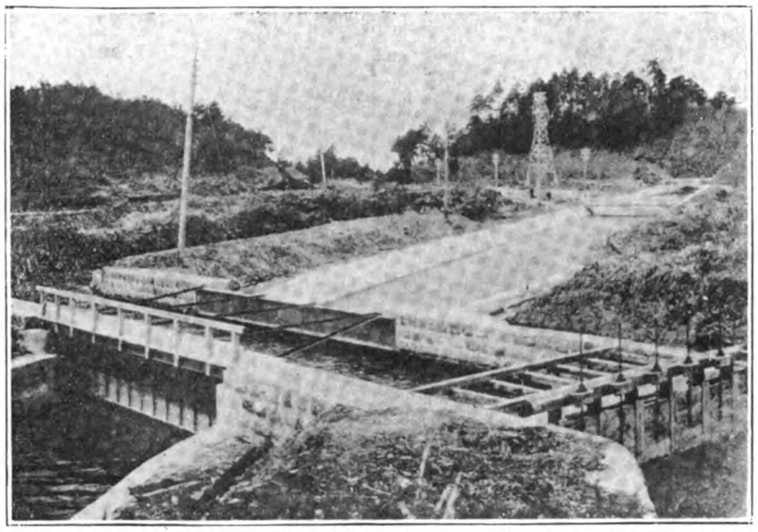


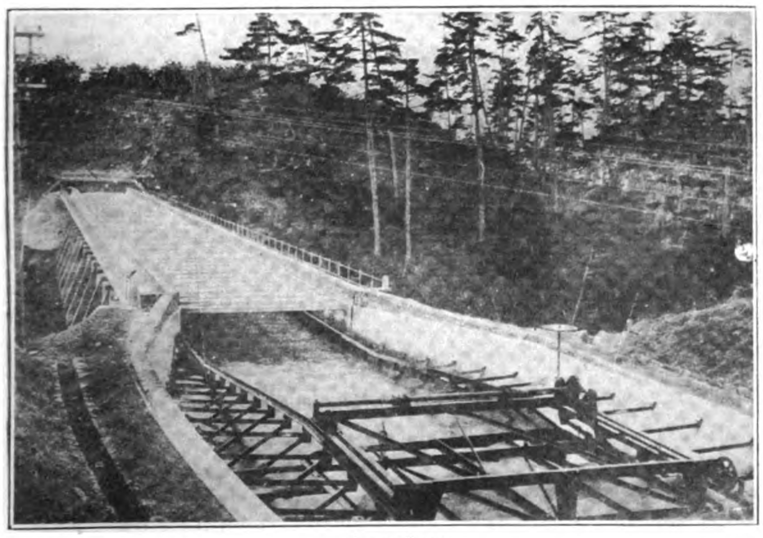
Regulating Gates of "Joruku-Kyo"

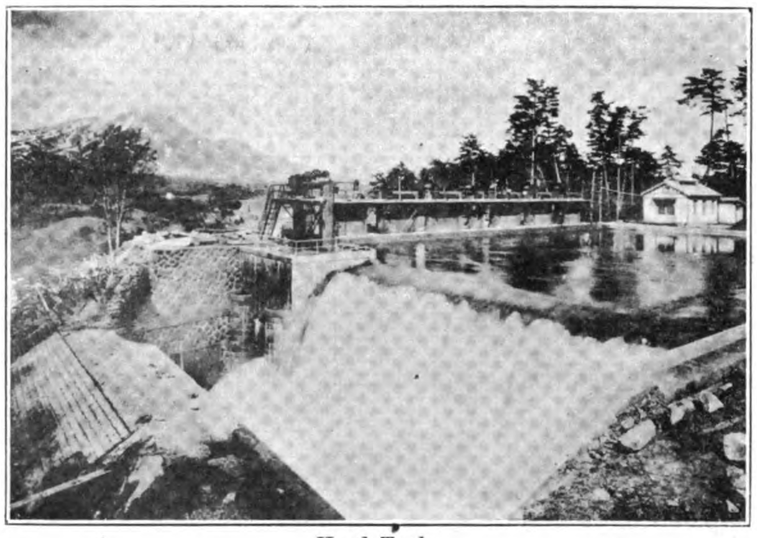

No. 1 Open Canal

No. 1 Conduit


No. 1 Tunnel

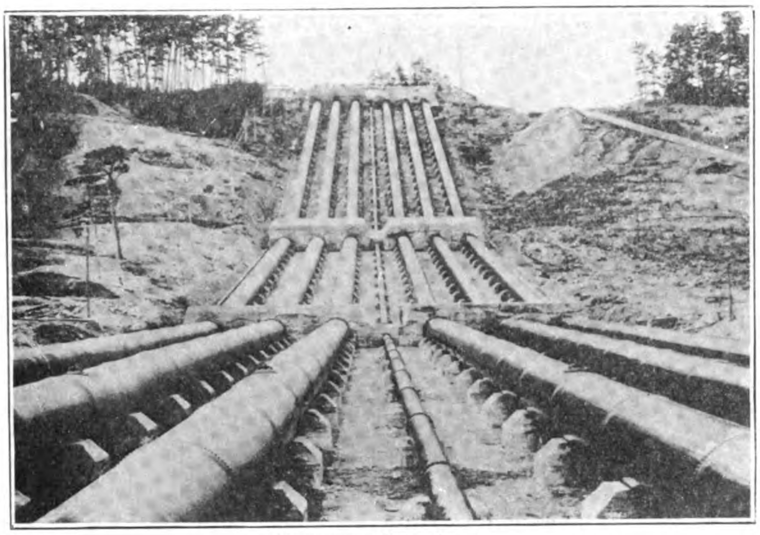

Tonokuchi Irrigation Flume Crossing the Power Canal


Aqueduct

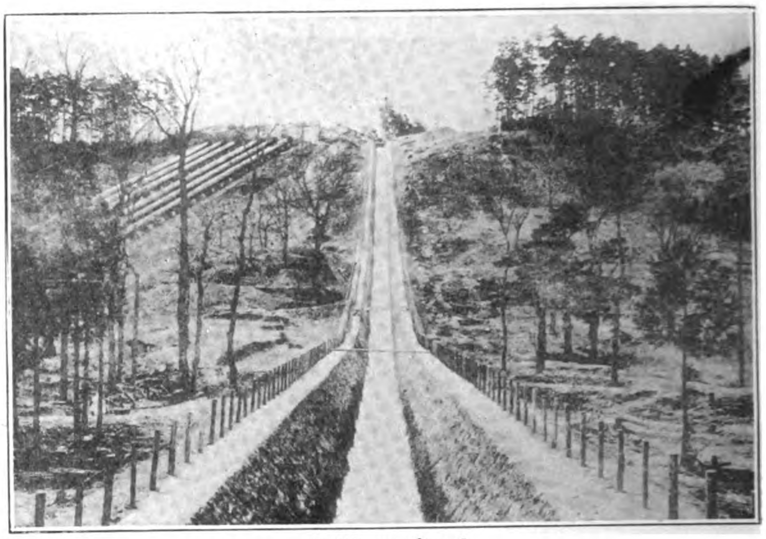

Head Tank

Lake Akimoto has an elevation of 2,390-ft. above sea-level, with a fall of 690-ft. to Lake Inawashiro. Its area is 1.2 square miles, draining a water-shed of about 42 square miles. Its depth is 39-ft. with a storage capacity of 1,100 million cubic feet. Between the two lakes are to be installed two power houses, the Kawakami power house for the upper section and the Myoka power house for the lower. By utilizing the three lakes as seasonal and daily regulating reservoirs, the maximum and mean flows through the Kawakami power house throughout the year are calculated to be 897 and 583 cubic feet per second respectively, the load factor being assumed at 65 per cent. A descrease in the water for the Myoka power house is necessary because of the existence of some irrigating canals above its site.

The following table shows mean effective head, maximum quantity of water and corresponding theoretical horse-power for the respective power houses.



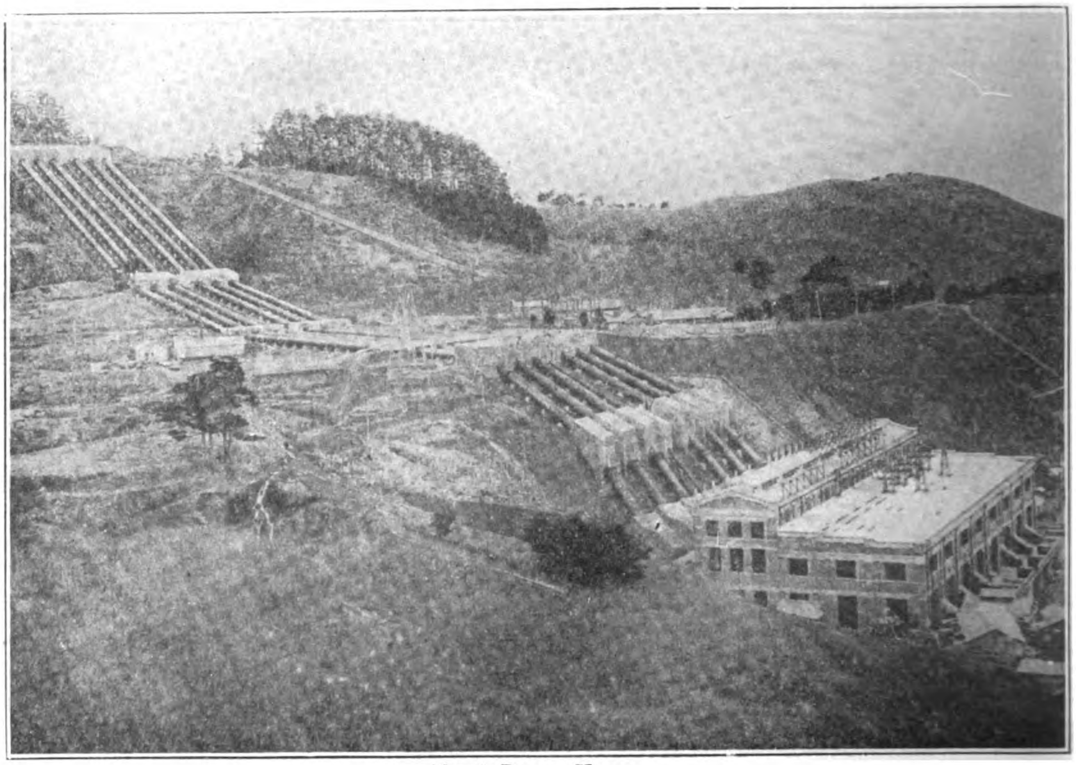
Pressure Pipe Lines



Spillway Canal

Power House	Mean Effective Head	Maximum Water Quantity	Theoretical H.P.
No. 1 ..	352.4 ft.	1,600 c.f.s.	64,000
No. 2 ..	228.2 ,,	1,600 ,,	41,400
No. 3 ..	133 ,,	1,478 ,,	22,300
No. 4 ..	211 ,,	1,450 ,,	34,700
Onogawa	202 ,,	485 ,,	11,100
Kawakami	274 ,,	897 ,,	27,900
Myoka ..	288 ,,	869 ,,	28,400
		Total ..	229,800

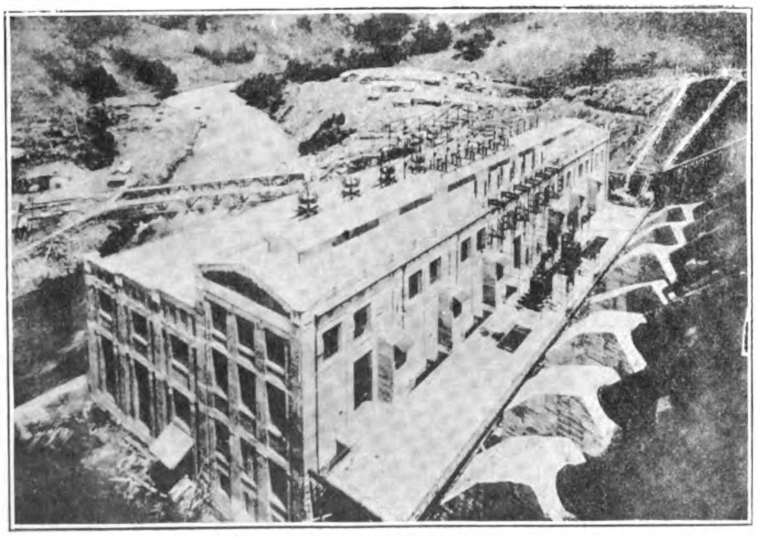
The output of the above seven power stations is to be centralized at No. 1 power house near Lake Inawashiro. The transmission lines run southward, passing through a mountainous region until they arrive at the town of Shirakawa. Thence they follow the government railway, traversing flat country, touching at the cities of Utsunomiya and Koga, and terminating at the Tabata receiving station near the city of Tokyo.



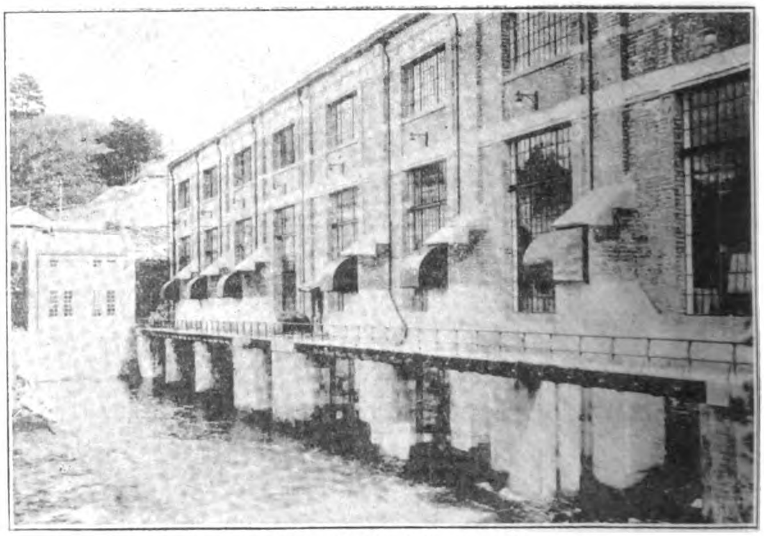
No. 1 Power House

Power Canals

Taking advantage of the topographical conditions of the district, the aggregate effective head of about 900-ft. along the Nippashi River is to be divided into four sections, with a power house for each section. Along the Nagase River, there will be installed three power houses and one canal without power house. The design of each canal will be found on next page.



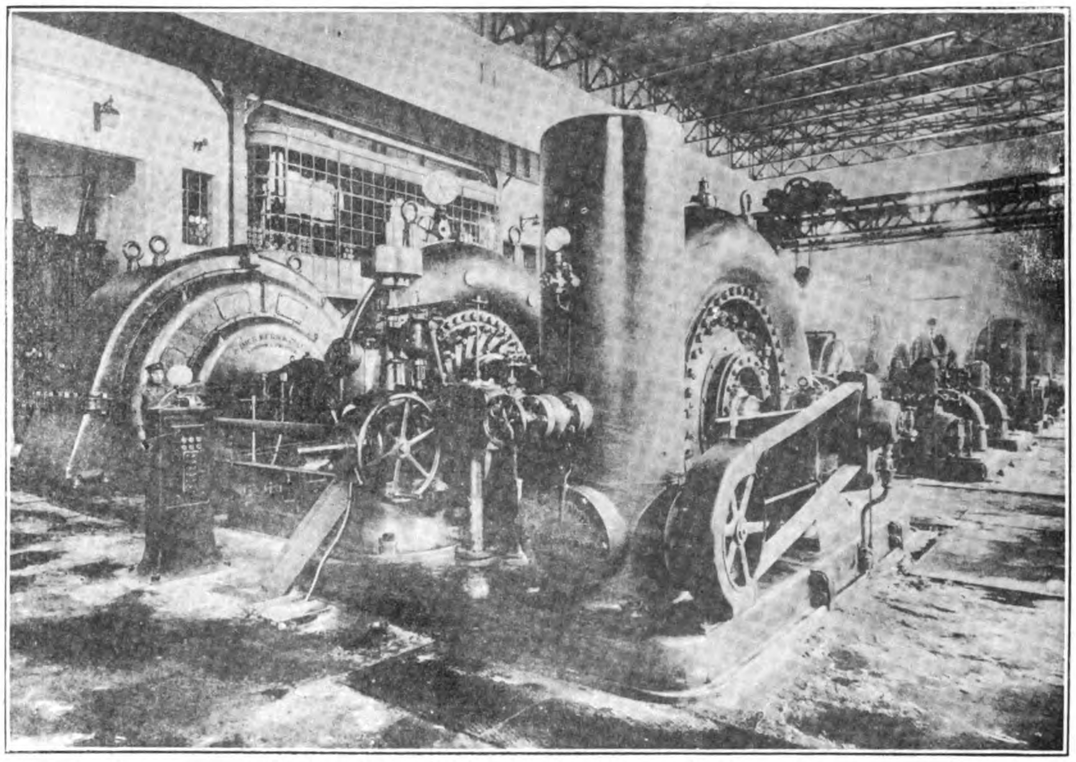
Roof Installation of No. 1 Power House



Tail Race of No. 1 Power House

No. 1 POWER CANAL.—The intake is placed at about 5,580-ft. down stream from "Juroku-kyo," which is located at the mouth of Lake Inawashiro. The length of the canal is about 7,920-ft., consisting of two tunnels, four open canals, five conduits, and two aqueducts. There are six (one spare) main pressure pipe lines, inner diameter being about 7-ft., and one exciter pipe line, under an effective head of 352.4-ft. The water from the tail-race of the power-house discharges directly into the Nippashi River. The grades of the canal varies from 1-ft. in 1,500 to 1-ft. in 2,000-ft.

No. 2 POWER CANAL.—The intake is placed near by the tail-race of No. 1 power house; total length, 3,990-ft., consisting of one tunnel and one open canal. There are five (one spare) main pipe lines, inner diameter about 7-ft., under an effective head of 228.2-ft. The water from the tail-race of the power house discharges directly into the Nippashi River. The grade of the canal is 1-ft. per 1,500-ft.



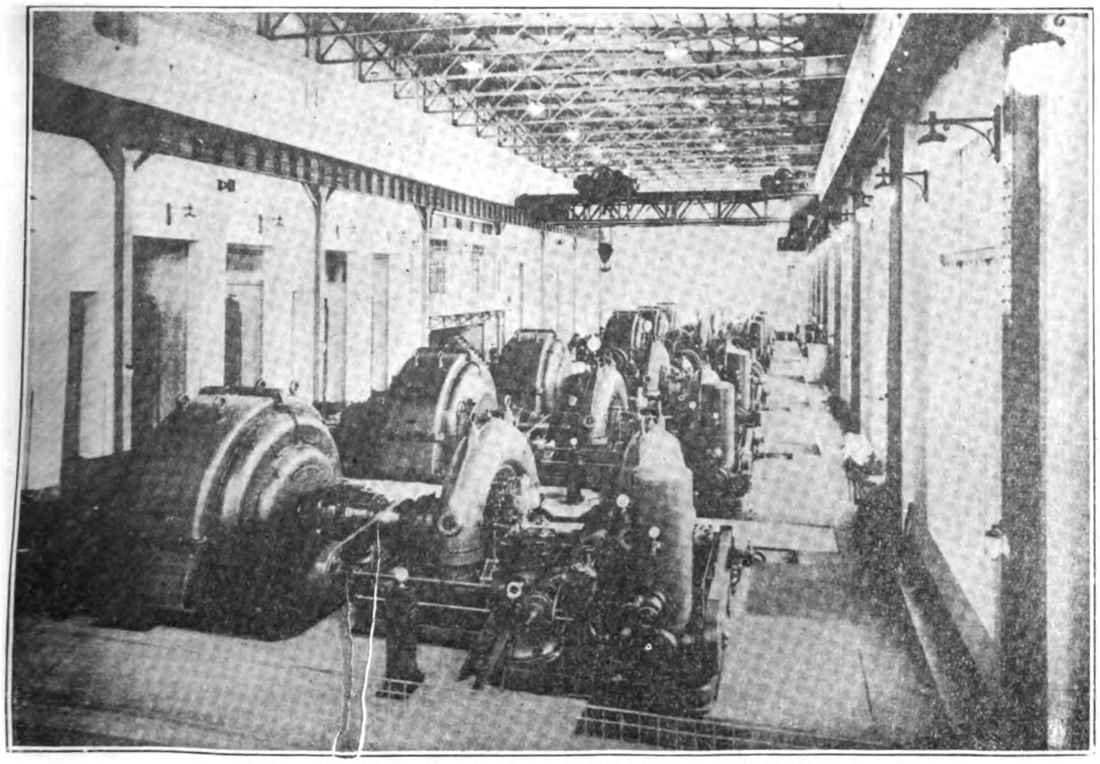
Generator and Turbine (English Electric Co., Ltd), Dick, Kerr Alternators, and J. M. Voith Water Wheels

No. 3 POWER CANAL.—The intake is placed near by the tail-race of No. 2 power house. The total length of the head canal is 5,670-ft., consisting of one tunnel, 2,450-ft., and one open canal, 3,220-ft. long. There are four (one for spare) main pipe lines, inner diameter about 7-ft. 6-in., under an effective head of 133-ft. The water from the turbine discharges directly into the common tail-race. The total length of the tail-race is 1,300-ft., consisting of one open canal. The grade of the head canal is similar to that of No. 1 Power Canal.

No. 4 POWER CANAL.—The intake is located at Uchigoe in Bandai village, about one mile and quarter down stream from No. 3 Power House. The total length of the canal is 11,160-ft., consisting of tunnels aggregating 1,590-ft. and open canals aggregating 9,570-ft. in length. There are four (one spare) main pipe lines, inner diameter about 7-ft. 6-in., under an effective head of 211-ft. The water from the tail-race of the power house discharges directly into the Nippashi River. The grade of the canal is similar to that of No. 1 Power Canal.

ONOGAWA POWER CANAL.—The intake is located on the south-eastern shore of Lake Onogawa. Total length is 6,550-ft. consisting of one tunnel and one open canal. There are two main pipe lines, inner diameter about 6-ft., under an effective head of 202-ft. The water from the tail-race of the power house discharges directly into Lake Akimoto. The grade of the canal varies from 1-ft. per 1,200-ft. to 1-ft. per 1,500-ft.

KAWAKAMI POWER CANAL.—The intake is located on the south-western shore of Lake Akimoto. Total length, 11,430-ft., consisting of one tunnel and one open canal. There are four (one spare) main pipe lines, inner diameter about 6-ft. 6-in., under an effective head of 274-ft. The water from the tail-race of the power house discharges into the Nagase River. The grade is similar to that of the Onogawa power canal.



General View of Generating Room, Power House No. 1

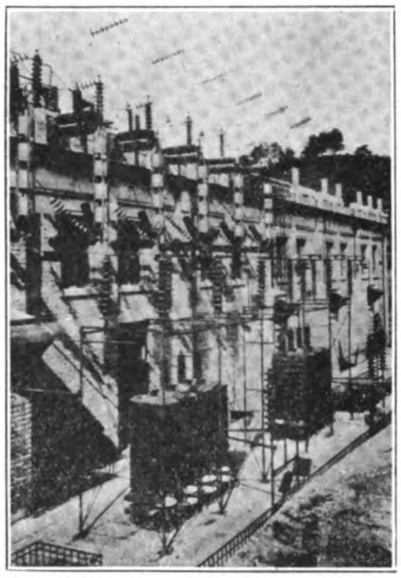
MYOKA POWER CANAL.—The intake is placed near by the tail-race of Kawakami power house. The head canal consists of one tunnel of 7,580-ft. long. There are four (one spare) main pipe lines, inner diameter about 6-ft. 6-in., under an effective head of 288-ft. The water from the turbine discharges into the Nagase River through a tunnel and an open canal. The grade is similar to that of Onogawa power canal.

NAGAMINE CANAL.—The intake is located on the south-eastern shore of Lake Hibara and the discharge end at the south-western shore of the Lake Onogawa. Total length of the canal is 5,070-ft. consisting of one tunnel and two open canals. This canal is to be used to discharge the reserve water in Lake Hibara.

Power Houses

Power is generated by alternating current generators, direct coupled to

water turbines, in three-phase, 6,600-volt, three-wire system. It is stepped up by transformers to 115,000 volts, and transmitted to the city of Tokyo. The line voltage at Tokyo, the receiving end of the line, is calculated to be 100,000 volts, which is stepped down by transformers to 11,000 volts and then distributed by underground cables to consumers in Tokyo and its suburbs. Power for small consumers in the neighborhood of the receiving station is supplied directly from the station by 3,300 volt transformers connected to the 11,000-volt-bus bar of the station. Power consumed in the neighborhood of the generating station is supplied at 6,600 volts.



High Tension Lightning Arresters

Main Transformers

The generating units in the seven stations will be as follows :

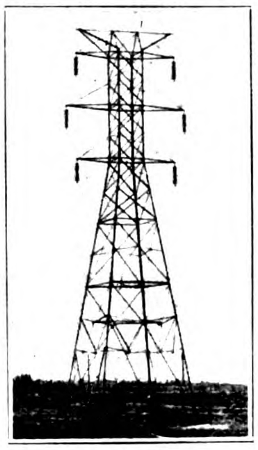
No. 1 POWER HOUSE.—Six sets (including one spare set) of 11,250 h.p. turbines and 7,777 k.v.a. generators.

No. 2. POWER HOUSE.—Five sets (including one spare set) of 10,250 h.p. turbines and 6,666 k.v.a. generators.

No. 3. POWER HOUSE.—Four sets (including one spare set) of 7,500 h.p. turbines and 4,800 k.v.a. generators.

No. 4. POWER HOUSE.—Four sets (including one spare set) of 11,500 h.p. turbines and 7,500 k.v.a. generators.

ONOGAWA POWER HOUSE.—Two sets of 7,200 h.p. turbines and 4,600 k.v.a. generators.

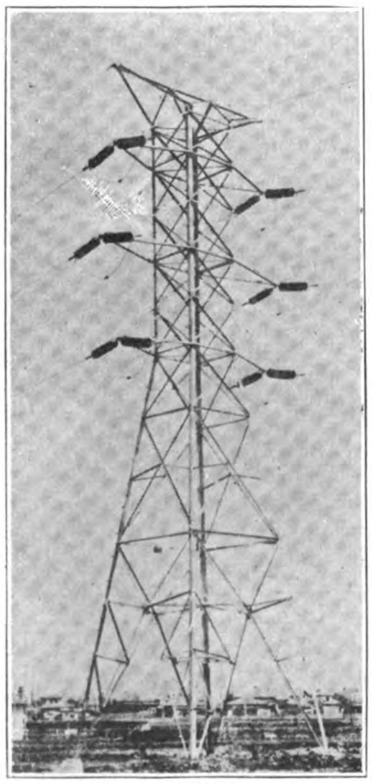


Type "A" Tower

KAWAKAMI POWER HOUSE.—Four sets (including one spare set) of 9,400 h.p. turbines and 6,000 k.v.a. generators.

MYOKA POWER HOUSE.—Four sets (including one spare set) of 9,400 h.p. turbine and 6,000 k.v.a. generators.

The main transmission line of bare copper cables suspended on steel towers, as well as tie lines between adjacent generating stations, will carry 115,000 volts. The main transmission line consists of two tower lines, each carrying two circuits thereon, while the tie line has only one tower line, carrying also two circuits.



Type "B" Tower

Reliable Water Supply

As far back as 1878, Mr. Van Dorn, a Dutch engineer, investigated and reported upon a plan for a vast tract of rice lands belonging to Asaka county. This plan provided for a maximum water supply of 200 cubic feet per second, drawn from Lake Inawashiro at Yamagata, a small village on its eastern bank. The Asaka Irrigating Association was then organized and with official approval erected the reglating gates called "Juroku-kyo," at Tonokuchi, at the mouth of the Nippashi River, the one outlet of Lake Inawashiro. From that date a watchman has been stationed to regulate the gates so as to maintain the lake at a constant level (within a certain margin) and keep a record of the water levels both inside and outside of the gates. These records show that the volume of water in the Nippashi River is amply sufficient to provide for the plans of the new enterprise.

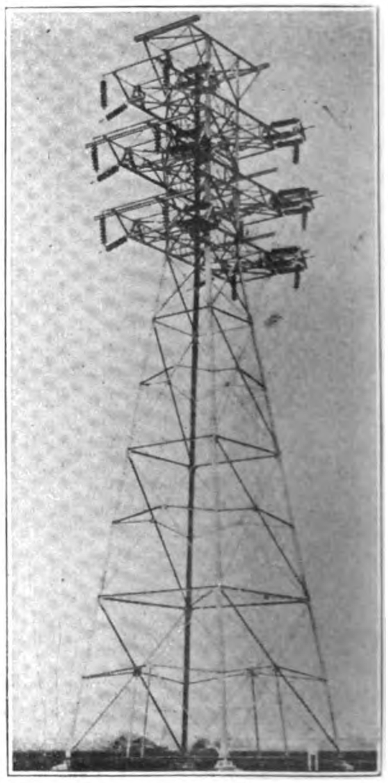
Flexibility of Supply

In regard to the regulation of the "Jurcku-kyo" gates, the Association fixed the limits of high and low-water levels of Lake Inawashiro, so as to prevent the overflowing of the lake or a scarcity of water in the irrigation canal. The quantity of water in the lake included within these two extreme levels, can be utilized as storage for the hydro-electric power plant.

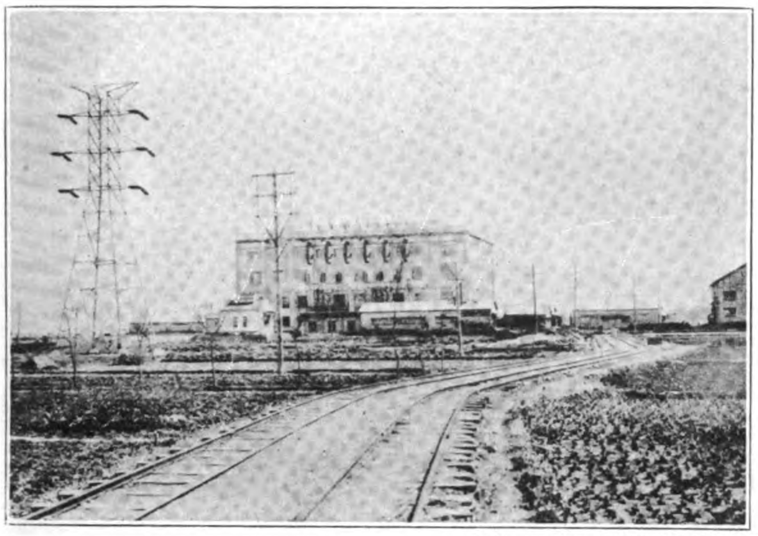
As Lake Inawashiro covers about 42 square miles, and the difference of the two extreme levels is 3.2 feet, there is storage capacity of about 3,500 million cubic feet. The rights to use this volume of storage water were acquired by the Inawashiro Hydro-Electric Power Co. Moreover, the company also secured the right to use Lakes Hibara, Onogawa and Akimoto as storage reservoirs, and a dam was built at the outlet of each. The storage capacity of these three lakes is 4,200, 330 and 1,100 million cubic feet, respectively. The total storage capacity in the four lakes is figured to be not less than 9,100 million cubic feet. With such a large reservoir close to power houses, the Inawashiro enterprise can always rely on an ample water supply, with no danger of floods in the river. These resources enable the company to construct and manage its power houses under most safe and economical conditions.

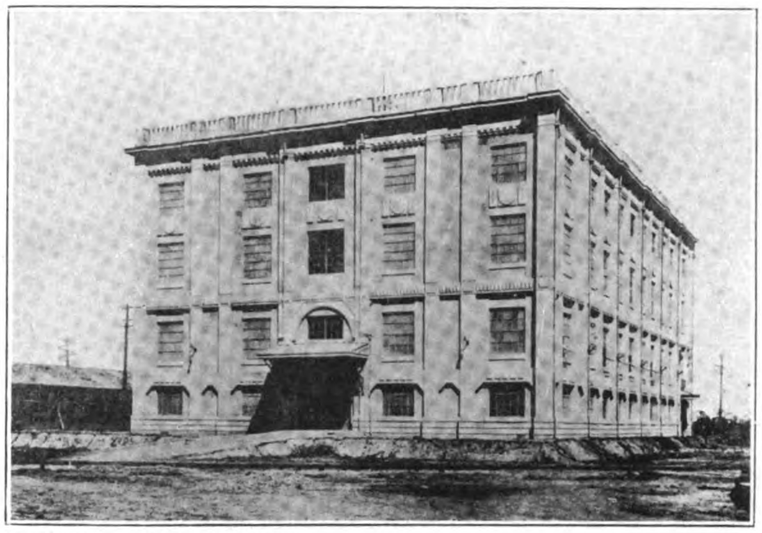
Construction Work

Although Lake Inawashiro is encircled by a range of high mountains and the fall of the Nippashi River bed is so steep that the rapids are about ten miles long, the general character of both banks of the river is very flat. Therefore, the aggregate length of the power canals along the Nippashi River, consisting mostly of open canals cut in flat country, is not more than about 30,000 feet for the total effective head of 924.6 feet. Moreover, there are a number of railway stations around Lake Inawashiro and the Nippashi River, within easy access to the power canals and power houses, which help to facilitate and cheapen the cost of construction.



Tone River Crossing Strain Tower



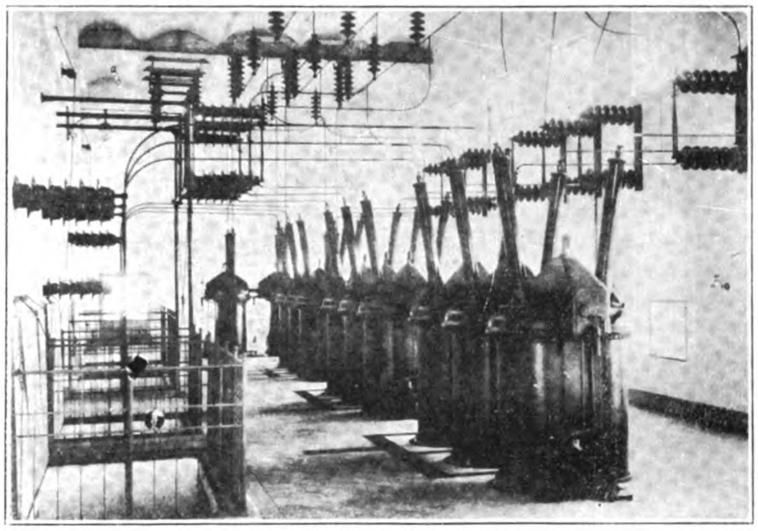


Tabata Receiving Station, Tokyo, Front and Rear Views

First and Second Installations

Renewal of "Juroku-kyo," construction of generating station No. 1, transmission line, A (two circuits), telephone line and Tabata receiving station, were included in the the first installation. This was completed and passed by the government on March 15th 1915, since when it has been in actual service.

Construction of dams at the outlets of Lakes Hibara, Onogawa and Akimoto, construction of No. 2 generating station, transmission line between No. 1 and No. 2 generating stations, and synchronous condenser equipments in Tabata receiving station were the features of the second installation. This was completed and passed by the government on August 1st, 1919, since when it has been in active operation.



High Tension Switch Room

"Juroku-Kyo"

"Juroku-kyo" erected by the Asaka Irrigating Association, is a stone masonry bridge across the Nippashi River at the outlet of the lake with fifteen piers, each pier serving as a support for sluice gate which regulates the level of Lake Inawashiro. It is to be now reconstructed, for the exclusive use of traffic, while new gates for regulating the water level are to be constructed at a point 60-ft. down-stream. These new gates will regulate the flow of water in the Nippashi River within the restrictions imposed by the government for maintaining a certain level in Lake Inawashiro.

The general features of these regulating gates are as follows :

Total Length of Regulating Gates : 250-ft.

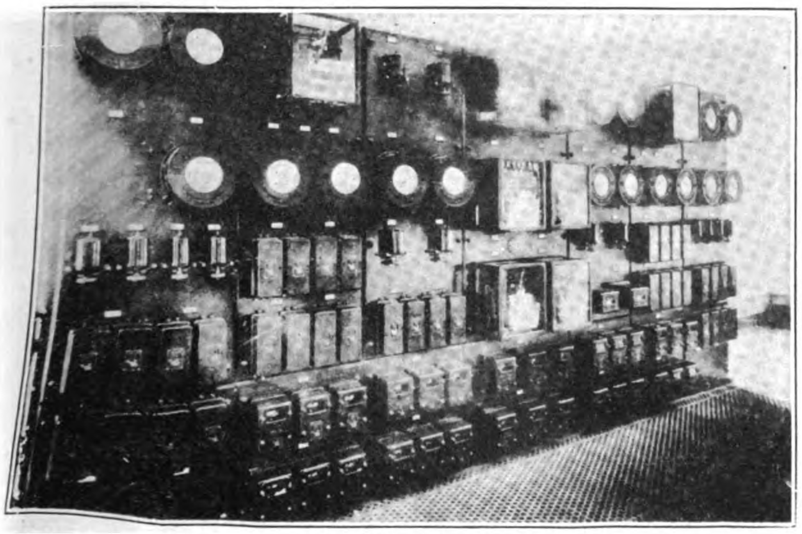
NUMBER OF GATES.—Sixteen in all. Thirteen are to let the water flow into the Nippashi River for the company's use ; the remaining three are for other water users.

PIERS.—Fifteen in all ; thirteen are four feet thick, and two six feet thick.

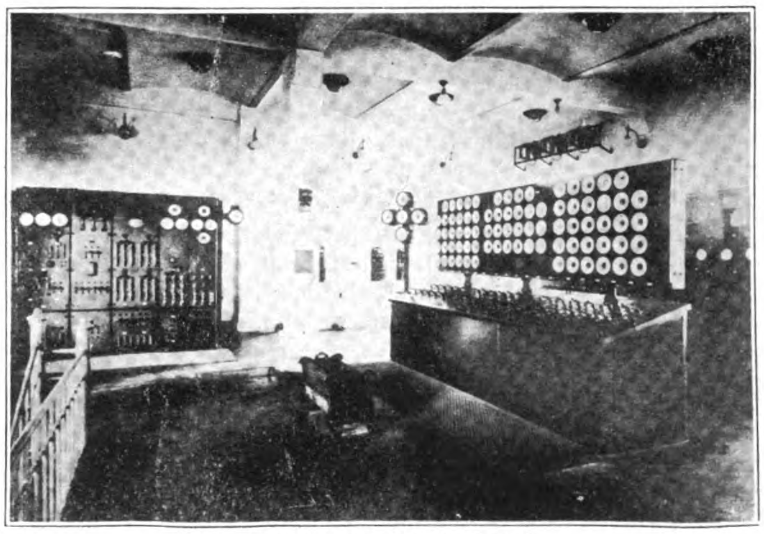
GATES.—All gates are made of steel, operated by either by hand or electric motor. They are nine feet high, with twelve feet span for thirteen gates and ten feet for the remaining three.

Lake Hibara

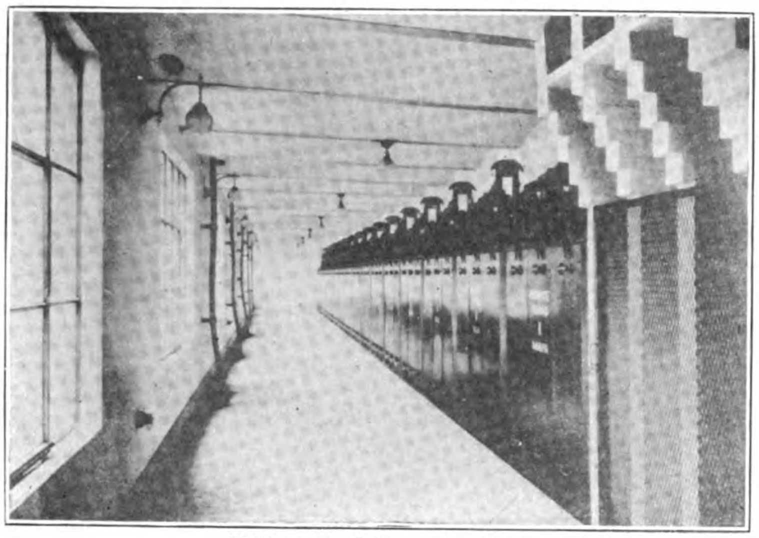
A dam and regulating gates were constructed at the natural outlet of Hake Hibara in order to convert the lake into the company,s reservoir. The general features of the dam and regulating gates follows.



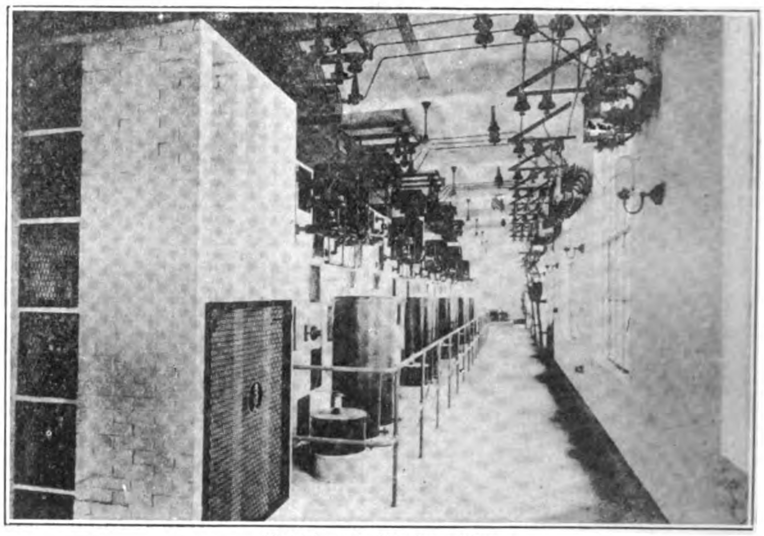
Relay Board



Main Control and Service Board



11,000 volt Oil Switch Room



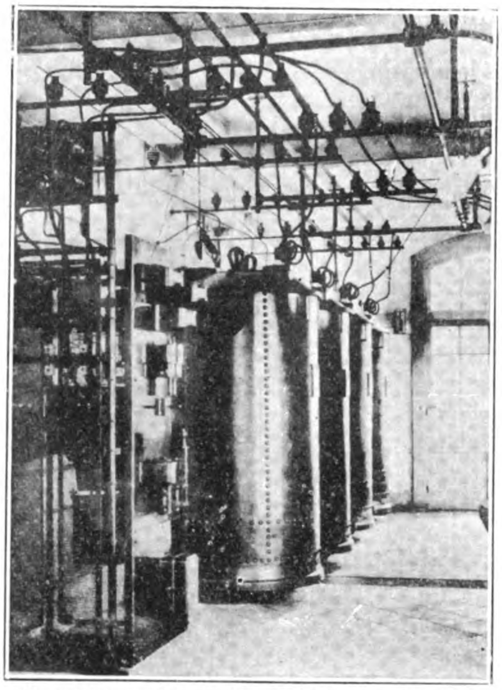
11,000 volt Busbar Room

(*a*) DAM.—Type, overflow type with parabollic down stream surface, with flash-boards for one section: length, total, 783 feet; length of dam with flash-boards, 624 feet, without flash-boards, 159 feet: height, 27.5 feet at highest part: height of flash-boards, 2 feet: structure, concrete with rubble stone facing.

(*b*) GATE.—Total length of structure, 35-ft.: height, 27.5 feet: width, 24 feet: number of gates, 2: size of gate hole, 6 feet wide, 6 feet high: gate, hand operated wooden gate, 7 feet high: piers, concrete without stone facing.

(*c*) RESERVOIR CAPACITY.—Useful depth of water, 18 feet: quantity of water reserved, 2,100 million cubic feet.

In order to increase the storage capacity of the lake, a canal from the south-eastern shore of this lake to the south-western shore of Lake Onogawa is now being constructed. After its completion, the useful depth and quantity of water stored in the lake will be 43 feet and 4,200 million cubic feet, respectively.



Transformer Room for Oji Electric Railway

Lake Onogawa

Gates and dam have been constructed at the natural outlet of Lake Onogawa in order to convert the lake into a company reservoir. These consist of regulating gates and a gate for floating timber, with earth and syphon dams. The regulating gates are situated at the centre, with the syphon dams on booth sides while the gate for floating timber is at one side of the syphon dam and the earth dams at both ends. The general features are as follows:

(*a*) REGULATING GATES.—Total length of structure, 33 feet: total height, of structure, 29 feet: total width, of structure, 23.2 feet: number of gates, 2: size of gate hole, 5.6 feet wide, 5.6 feet high: gate, hand operated wooden gate, 7 feet high: pier, concrete.

(*b*) SYPHON DAMS.—Total length, 120 feet: number of syphon, 6: section of syphon, 6 feet square: head of syphon, 11.9 feet: total capacity of six syphons, 3,500 cubic feet per second: structure, concrete dam. Reinforced concrete syphon.

(*c*) GATE FOR FLOATING WOOD.—Height of gate, 6.5 feet: width, 5 feet: type, log gate.

(*e*) EARTH DAM.—Length, 102 feet: width at top, 15 feet: slope, 1 foot in 2.5 feet: front surface, rubble stone facing; back surface, lawn facing.

(*f*) RESERVOIR CAPACITY.—Useful depth of water, 105 feet: quantity of water stored, 220 million cubic feet.

After the completion of the Onogawa generating station, the useful depth and quantity of water stored in the lake will be 29 feet and 330 million cubic feet, respectively.

Lake Akimoto

Gates and dams have been constructed at the natural outlet of Lake Akimoto. In addition to the regulating gates, there is one for floating timber with syphon dams, masonry and earth dam. The regulating gates are situated at the centre, with syphon dams at both sides of the regulating gates; the gate for floating timber at one side of the syphon dam and the earth and masonry dams at both ends. The general features are as follows:

(*a*) REGULATING GATES.—Total length of structure, 39 feet: height, 37 feet: width, 22 feet; number of gates, 2: size of gate holes, 5 feet high, 5 feet wide: gate, hand operated wooden gate, 6 feet high: pier, concrete.

(*b*) SYPHON DAMS.—Total length, 86 feet: number of syphons, 4: section of syphon, 6 feet square: head of syphon, 19.5 feet: total capacity of four syphons, 2,550 cubic feet per second: structure, concrete for dam; reinforced concrete for syphon.

(*c*) TIMBER GATE.—Height, 6 feet: width, 5 feet: type, log gate.

(*e*) EARTH DAM.—Length, 1,290 feet: mean height, 33 feet: width at top, 24 feet: slope, 1 foot in 2.5 feet: front surface, rubble stone facing: back surface, lawn facing.

(*f*) MASONRY DAM.—Type, overflow with parabolic down stream surface: length, 582 feet: mean height, 19 feet: width at top, 3 feet: structure, concrete with rubble stone facing.

(*g*) RESERVOIR CAPACITY.—Useful depth of water, 20 feet: quantity of water stored, 750 million cubic feet.

After the completion of the Kawakami generating station, the useful depth and quantity of water stored in the lake will be 39 feet and 1,100 million cubic feet, respectively.

Power Canal for No. 1 Generating Station

The total length, covering several sections of open canals, conduits, tunnels and aqueducts, is nearly 7,920 feet. The grade is one to two thousand for the upper section of 5,760 feet and one to fifteen hundred for the remaining section. The cross section

of the canal is adequate for a flow of 1,600 cubic feet of water per second. A brief description of the work, follows :

(*a*) HEADWORKS.—This consists of an overflow dam across the river, with an intake for the power canal adjacent to the dam. The dam is designed to pass a maximum of 6,000 cubic feet of water per second over its spillway and 4,000 cubic feet per second through the sluice gates, a total of 10,000 cubic feet per second.

(1) DAM.—Type, overflow type with parabolic down stream surface : length, total, 389 feet ; length of overflow proper, 238 feet, the remainder is taken up by the sluice gates : width at top, 5 feet: height, 18 feet from river bed : width at base, 40.5 feet : structure, concrete with rubble stone facing : sluice gates, there are two stoney type hand operated sluice gates, each 8 feet wide, 10 feet high.

(2) INTAKE.—Situation, about 5,580 feet down-stream from "Juroku-kyo" and on the up-stream side of the dam : intake gate, there are four stoney type hand or motor operated sluice gates, each 8 feet wide and 10 feet high : piers, concrete with brick and cut stone facing.

(*b*) OPEN CANAL.—Length, 5,410 feet, covering four separate sections from No. 1 to No. 4 : structure, the canal is of concrete lined with cement mortar. There are four different standard sectional forms corresponding to the nature of soil and grade of canal. Thickness of concrete varies from 1 foot to 3 feet for the side walls and 1 foot throughout for the bottom. At the part where earth cutting was made, a bench of six feet wide is installed.

(*c*) CONDUIT.—Length, there are five sections, with an aggregate length of 704 feet : structure, cross section of the conduit is horse-shoe shape. The arch is constructed of reinforced concrete, while the side wall and invert of plain concrete. All the surface is lined with cement mortar. The earth cover on arch is 4 feet thick.

(*d*) TUNNEL.—Length, there are two sections, the first, 1,200 feet long, and the second, 275 feet long : structure, cross section of the tunnel is horse-shoe shape, 17 feet in height and radius. The side wall and invert are made of concrete, while the arch is brick work backed with rubble. All the surface is lined with cement mortar.

(*e*) AQUEDUCT.—Length, there are two aqueducts in the canal, the first 218 feet long and the other 268 feet long : structure, flume and supporting piers are made of reinforced concrete. Cross section of the flume is supported by a row of three columns, each 18 inch square, at intervals of 16 feet. The thickness of the flume is 17 inches at the side walls and 24 inches at the bottom.

(*f*) FOREBAY.—Size, 88 feet long by 122.5 feet wide : area, 10.780 square feet : depth, from 18 feet 10 inches to 21 feet 10 inches : sluice gate, there are eight stoney type hand or motor operated sluice gates, of which, six are for the main penstocks, one for exciter penstock, and one for the spillway. The size of each of the first ix sis 11 feet wide and 14 feet high, of the next, 4 feet wide and 11 feet high ; and the last, 11 feet wide and 10 feet high : structure, side walls and bottom are of concrete work lined with cement mortar. Some parts are lined with brick and cut stone.

(*g*) SPILLWAY.—The water spilled from the head by the syphon dam discharges to the river at a point about 300 feet down-stream of power house.

The total length of the spillway is about 1,420 feet including vertical well, conduit, open canal and pipe. The well is 10 feet diameter, 29 feet deep, 3 feet thick, made of concrete with cut stone facing. The conduit is 115 feet long, 7 feet wide, 9.6 feet high from invert to arch crown, lined with cut stone, and built on 1 to 33 slope. The open canal, trapezoidal in form, is lined with rubble stone laid in cement mortar. The bottom width is 6 feet, depth 8 feet, and the side slope 1 to 0.5. The slope of the canal bed is divided in four parts. The first 67 feet has a slope of 1 to 0.5, the second 392 feet, 1 to 2.8 feet, the third 267 feet, 1 to 5.0 and the fourth 276 feet, 1 to 100. The pipe is 285 feet long, 6 feet in diameter, made of rivetted mild steel plate of three-eights inch thick.

No. 1 Generating Station

(*a*) NAME, No. 1 Generating Station of the Inawashiro Hydro-Electric Power Company, Limited.

(*b*) SITUATION.—Nippashi-mura, Kawanuma-gun, Fukushima-ken, Japan.

(*c*) BUILDING.—Main building of the generating station consists of two parts : the generating and transformer rooms. The generating room is a single story steel frame brick building, 249 feet long, 66 feet wide, and 44 feet high, measured from ground floor to bottom of roof truss. The transformer room is a three story steel frame brick building, 249 feet long, 38 feet wide and 59 feet high from ground floor to bottom of roof truss.

(*d*) PENSTOCK. (1) Main Penstock.—Inner dia., four kinds of 2.25 m., 2.13 m., 2.01 m. and 1.9 m. from top to bottom.

Thickness.—Twenty-eight kinds from 10 mm. to 20.6 mm : length, 1,348 feet, average of six pipe lines : material, welded pipe made of Siemens-Martin mild steel : joint, bump joint : number, six pipe lines, of which one is spare. Maker, Thyssen & Company, Germany.

(2) EXCITER PENSTOCK.—Inner dia., four kinds of 0.8 m., 0.75 m., 0.7 m., and 0.65 m. from top to bottom : thickness, 8 mm. throughout : length, nearly 1,338 feet : material, welded pipe made of Siemens-Martin mild steel : joint, muff joint : number, one. Maker, Thyssen & Company, Germany.

(*e*) WATER TURBINES.—(1) Main turbine, type, horizontal Francis double spiral turbine : effective head, 104 metres : capacity, 11,250 h.p. at full gate opening : speed, 375 r.p.m. : number, six, of which, one is spare. Maker, J. M. Voith, Germany.

(2) EXCITER TURBINE.—Type, horizontal impulse turbine : effective head, 98 metres : capacity, 492 h.p. at full gate opening : speed, 500 r.p.m. : number, four, of which, two are spare. Maker, J.M. Voith, Germany.

(*f*) GENERATORS.—Type, totally enclosed forced draught horizontal shaft alternating current generator : capacity, 7,000 k.w. : power factor, 90 per cent. : phase, three phase : voltage, 6,600 volts : frequency, 50 cycles per second : speed, 375 r.p.m. : connection, star, the neutral grounded through resistance : excitation, exciting current is supplied from separate exciter plant : number, six of which one is spare. Maker, Dick, Kerr & Co., England.

(*g*) EXCITER.—Type, horizontal shaft direct current generator : capacity, 200 k.w : voltage, 250 volts : speed, 500 r.p.m. : connection, 2 wire system : excitation, shunt wound self-excitation : number, four, of which, two are spare. Maker, Dick, Kerr & Co., England.

(*h*) MAIN TRANSFORMERS.—Phase, single : capacity, 4,400 k.v.a. : voltage at high-tension side, 115,000 volts : voltage at low-tension side, 6,600 volts : frequency, 50 cycles : connection, delta in both high and low-tension sides : cooling device, oil immersed water cooling : number, twelve, of which three are spare. Maker, Westinghouse Electric & Mfg. Co., U.S.A.

(1) SWITCHING AND OTHER APPARATUS.—The switching apparatus and switchboards were made by the Westinghouse Electric & Manufacturing Company. Tirrill voltage regulators and Nicholson's arc suppressors are installed. There are one 55-ton and one 10-ton electric traveling crane, the former supplied by Jospeh Booth & Brothers, England, and the latter by Carrick & Richie, England.

Power Canal for No. 2 Generating Station

The total length of the power canal, embracing one open canal and one tunnel, is nearly 3,990 feet. The cross section of the canal is adequate for the flow of 1,600 cubic feet of water per second with a grade of 1 foot in 1,500. A brief description of each section of the work, follows :

(*a*) HEAD WORKS.—This consists of an overflow dam across the river, and an intake for the power canal adjacent to the dam.

(1) DAM.—Type, overflow type with parabolic down stream surface : length, 110 feet : height, 225 feet from river bed : width, 8 feet at top and 31.6 feet at base : structure, concrete

with rubble stone facing: sluice gate, one stoney sluice gate, 9 feet wide and 9.6 feet high.

(2) INTAKE.—Situation, about 1,000 feet down stream from No. 1 power station: sluice gate, two hand or electrically operated stoney sluice gates, each 18 feet wide and 14 feet high: piers, concrete, with brick and cut stone facing.

(*b*) TUNNEL.—Length, 2,220 feet: size, cross section of tunnel is horse-shoe shape, 17 feet in height and radius.

(*c*) OPEN CANAL. Length, 1,770 feet: structure, concrete, thickness, 1.2 feet for side wall and 1 foot for bottom.

(*d*) FOREBAY.—Size and depth, 139 feet long, 81 feet wide, 19.29 to 22 feet deep: sluice gate, there are five hand and motor operated main stoney sluice gates for main penstock and a hand operated stoney sluice gate for the spillway. The size of each of the first five, is 12.6 feet wide, while that of the latter is 4 feet wide and 4 feet high: structure, side wall and bottom are of concrete.

(*e*) SPILLWAY.—The water spilled from the forebay by syphon dam discharges into the river. Length, 1,060 feet, including 129 feet tunnel: structure, concrete and rubble stone masonry.

No. 2 Generating Station

(*a*) NAME.—No. 2 Generating Station of Inawashiro Hydro-Electric Power Co., Ltd.

(*b*) SITUATION.—Nippashi-mura, Kawanuma-gun, Fukushima-ken, Japan.

(*c*) BUILDING.—The main building of the generating station consists of two parts: generating and transformer rooms. The generating room is a single story steel frame brick building, 171 feet long, 66 feet wide, and 44 feet high, measured from ground floor to bottom of roof truss. Transformer room is a three story steel frame brick building, 205 feet long, 36 feet wide, and 44 feet high, from ground floor to bottom of roof truss.

(*d*) PENSTOCK.—Inside diameter, 7.87, 7.4, 7.0, 6.5 and 6.0 feet: thickness, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$ and $\frac{3}{4}$ inches: length, 955 feet in average of five penstocks: material, rivetted mild steel: number, 5, including 1 spare. Maker, Tokyo-Ishikawajima Shipbuilding Co., Ltd.

(*e*) WATER TURBINE.—Type, horizontal twin spital Francis type turbine: effective head, 226.5 feet at full gate: capacity, 10,250 h.p. at full gate: speed, 375 r.p.m.: number, 5, including 1 spare. Maker, Kobe Works of Mitsubishi Dockyard & Shipbuilding Co., Ltd.

(*f*) GENERATOR.—Type, totally enclosed forced draught horizontal shaft alternating current generator: capacity, 6,000 k.w: power factor, 0.9: phase, three phase: voltage, 6,600 volts: frequency, 50 cycle per second: speed, 375 r.p.m.: connection, star, neutral point grounded through resistance: excitation, excited singly with direct connected exciter: number, 5, including 1 spare. Maker, Shibaura Engineering Works, Ltd.

(*g*) EXCITER.—Type, overhang type direct current generator: capacity, 65 k.w.: voltage, 250 volts: speed, 365 r.p.m: connection, 2 wire: excitation, self-excited shunt wound with interpoles: number, 5, including 1 spare. Maker, Shibaura Engineering Works, Ltd.

(*h*) MAIN TRANSFORMER.—Capacity, 4,400 k.v.a: phase, single phase: voltage at high-tension side, 115,000 volts: voltage at low-tension side, 6,600 volts, with two 2.5 per cent. low voltage taps: frequency, 50 cycles per second: connection, delta connection in both high and low-tension sides: cooling, oil immersed water cooling: number, six. Maker, Shibaura Engineering Works, Ltd.

(*i*) SWITCHING AND OTHER APPARATUS.—All switching apparatus and switchboards were made by the Shibaura Engineering Works, excepting the 115,000 volt lightning arresters from the Westinghouse Electric & Mfg. Co. There is one 50-ton overhead traveling crane made by the Tokyo-Ishikawajima Shipbuilding Company. A special device is used for inter-connected voltage regulation of No. 1 and No. 2 generating stations.

Transmission Lines

There is one 115,000 volt transmission line between No. 1 generating station and the Tabata receiving station, and between No. 1 and No. 2 generating stations, also, one 6,600 volt transmission line between No. 1 and No. 2 generating stations.

(*A*) 115,000 VOLT TRANSMISSION LINE.—(a) Length, between No. 1 generating station and Tabata receiving station, 140.1 miles: between No. 1 and No. 2 generating station, 1 mile.

(*b*) CONDUCTOR.—Size, seven strand of 168 mill wires, nearly 0.51 inches outside diameter, 197,600 circular mills in cross section: material, hard drawn copper: number, six cables are strung on one tower making up two 3-phase 3-wire circuits: sag, for standard span of 550 feet, at maximum temperature, the clearance of the lowest cable above ground is 27.7 feet and sag of the cable is 15.73 feet: arrangement, six cables are arranged in two vertical rows, having the middle cables placed 2 feet outside the rest. Horizontal distance of two rows at the middle cable is 23 feet 6 inches in A tower and 24 feet 6 inches in B and C towers. Vertical distance of adjacent cables is 10 feet for all standard towers: transposition, no special transposition tower is used. Maker, Furukawa & Co., Japan.

(*c*) GROUND CABLE.—Size, seven strand of 125 mill wires, about $\frac{3}{8}$-in. in outer diameter: material, galvanized Siemens-Martin steel: number, two on one tower: arrangement, two ground cables are fixed at both ends of top arm, 19 feet 6 inches apart at A tower and 20 feet 6 inches apart B and C towers. Maker, Roebling & Company, U.S.A.

(*d*) TOWERS.—There are three standard types of towers:

STANDARD TOWER "A": A towers are to be erected at points where lines are straight or turn at an angle less than six degrees. Conductors are suspended by the use of the suspension insulators and ground cables fixed at the top arm.

STANDARD TOWER "B": B towers are of special strength to bear the strain of all six conductors and the two ground cables. They serve for diminishing the vibration of conductors and also to prevent any extension of damage to the tower line when any one of the A towers fail. They are erected at every twentieth tower, and at points where the line angle exceeds thirty degrees. Conductors are secured by the use of strain insulators, and ground cables fixed at the top arm.

STANDARD TOWER "C": C tower, is a still stronger tower, designed to resist the transversal pull on line angles of thirty degrees, and are used at points where the line angle is more than six degrees but less than thirty degrees. Conductors are fixed by the use of strain insulators, and ground cables fixed at the top arm.

SPECIAL TOWER: Besides the above-mentioned three standard towers, there are many special towers for crossing rivers, such as Tone, Kinu, Ara, etc., and for crossing extra high-tension transmission lines belonging to other companies.

A rough description of the tower is as follows:

Standard Span, 550 feet: actual average span, 516 feet: longest span, two 1,530 feet making total length at 3,060 feet (crossing the River Tone): material, galvanized mild steel, with sherardized bolts: height, A tower, 72 feet 9 inches; B tower, 72 feet; C tower, 72 feet: base, A tower: square of 18-ft. 8$\frac{10}{16}$-in. side; B tower: square of 19-ft. 7$\frac{1}{4}$-in. side; C tower, square of 19-ft. 7$\frac{1}{4}$-in. side: weight, A tower, 5,890-lbs. (excluding anchorage); B tower, 12,160-lbs. (excluding anchorage): C tower, 9,900-lbs. (excluding anchorage).

FOUNDATION.—Towers are set on galvanized mild steel anchorge. Where the bearing power of soil is not strong enough, concrete and piling are to be added. Weight of anchorage is as follows: A tower, 803-lbs.; B tower, 4,413-lbs.; C tower, 2,858-lbs.

NO. OF TOWERS.—Number of towers erected is as follows: A tower, 1,128; B tower, 112; C tower, 175: special tower, 34: total 1,449. Maker, American Bridge Company, U.S.A.

(*e*) INSULATORS.—Type, suspension type: Material, porcelain: number of units per string, seven for suspension insulator, eight for strain insulator: size, diameter of shell, 12

inches. Distance of centres of connecting pins, 5½-in.: test voltage, dry test: 70,000 volts for 5 minutes for one unit. 380,000 volts for 1 minute for seven units, in one string.

West Test: Under a jet of distilled water directed at 45 degrees to the string, at the rate of precipitation of 0.2 in per square inch per minute. 45,000 volts for 5 minutes for one unit. 290,000 volts for 1 minute for 7 units in one string: mechanical test, under tension of 5,000-lbs. on sign of yielding allowed, but it breaks at above 10,000-lbs. Makers, R. Thomas & Son Company, U.S.A.; Nippon Insulator Co., Ltd.; Shofu Insulator Co., Ltd.

(*f*) SWITCHING STATIONS.—Three switching stations are installed along the transmission line, spaced nearly equally at Shirakawa, Utsunomiya, and Koga, for the purpose of exchanging the sections of the circuits. The installations are of the outdoor type, provided with hand operated oil switches. The switching apparatus was supplied by the Westinghouse Electric & Mfg. Co., but the switching tower structure was made by Ishikawajima Iron Works, Tokyo, Japan.

(*B*) 6,600 VOLT TRANSMISSION LINE—(*a*) Length, 1 mile: conductor: size, seven strand of 168 mil wires, nearly 0.51 inches in outside diameter, 197,600 circular mils in cross section: material, hard drawn wire: number, 6: dip, maximum dip at standard span of 150 feet is 2.5 feet: spacing, interaxial distance is 2.15 feet. Maker, Furukawa & Co., Ltd.

(*c*) POLE.—Standard span, 150 feet: maximum span, 192 feet: construction, the support is H form wooden pole using two creosoted *sugi* (a kind of cedar) poles of 32 feet length and 7⅝ inch top diameter. The interaxial distance of poles at ground level is 5.4 feet and that at the top is 4.25 feet, and bottom of pole is 6 feet below ground level. Two 7-foot galvanized angle iron cross arms are attached to the poles at the points 1 foot and 3.25 feet below the top.

(*d*) INSULATOR.—Type, three petticoat pin type insulator: material, porcelain: size, maximum diameter, 5½ inches: height, 4½ inches: dry flashover voltage, over 55,000 volts. Maker, Nippon Insulator Co., Ltd.

(*C*) TELEPHONE LINE.—A separate telephone line is installed between generating and receiving stations and between generating stations, along the route of main transmission line. This telephone line comprises three 2-wire circuits as follows:

Circuit No. 1, for direct communication between the stations: No. 2, this is divided into two sections at Utsunomiya switching station, the middle point in the line. The first section is for communication between the generating station and Utsunomiya switching station, and the second section is for use between Utsunomiya switching station and Tabata receiving station. These two sections can be interconnected at Utsunomiya, with each other or to any one of No. 1 or No. 3 circuits, when necessary: No. 3, this is divided into four sections at three switching stations. Each section is for communication between adjacent switching stations and patrol men.

A brief description of the construction of this telephone line is as follows: Standard span, 180 feet: standard pole, 24 feet, Sugi pole, 6 inches in diameter at top end: Atm, Nara, impregnated with creosote: insulator, porcelain, double petticoat insulator: conductor, hard-drawn copper wire weighing 200-lbs. per mile: ground wire, one S.W.G. No. 8 galvanized iron wire is fixed at top of pole and connected to earth wire of it.

For special long spans crossing rivers, etc., special pole and copper clad steel wire are used. Besides heat coils, arresters and fuses, drainage coils and telephone transformers are installed as safety devices for the telephone instruments.

Tabata Receiving Station

(*A*) NAME.—Tabata Receiving Station of Inawashiro Hydro-Electric Power Company, Limited.

(*B*) SITUATION.—Near Tabata Railway Station, Tokyo, Japan.

(*C*) BUILDING.—There are two main buildings, i.e., transformer and switch house and synchronous condenser house. The first is a three story reinforced concrete building, 144 feet long, 85 feet wide, and 57 feet high from ground floor to bottom of roof truss. The last consists of the synchronous condenser room and switch room.

The synchronous condenser room is a single story brick building, 96 feet long, 40 feet wide, and 32 feet high from ground floor to bottom of roof truss. The switch room is a two story brick building, 21 feet long, 40 feet wide and 32 feet high.

(*D*) MAIN TRANSFORMERS.—Phase, single phase: capacity, 4,000 k.v.a.: voltage at high-tension side, 100,000 volts: voltage at low-tension side, 11,000 volts: frequency, 50 cycles per second: connection, delta in both high and low-tension sides: cooling device, oil immersed water cooling: number, twelve, of which three are for spare. Maker, Westinghouse Electric & Mfg. Co., U.S.A.

(*E*) AUXILIARY TRANSFORMERS.—These transformers are for supplying power to small consumers in the neighborhood of the station. They are as follows:

Phase, single: capacity, 500 k.v.a.: voltage at high-tension side, 11,000 volts: voltage at low-tension side, 3,300 volts: frequency, 50 cycles: connection, delta in both high and low-tension sides: cooling device, oil immersed water cooling: number, nine, of which three are spare. Maker, Shibaura Engineering Works, Tokyo, Japan.

(*F*) SYNCHRONOUS CONDENSER.—Type, totally enclosed forced draught horizontal shaft synchronous condenser: capacity, 7,500 k.v.a. continuously and 9,000 k.v.a. for two hours: power factor, 0: phase, three phase: voltage, 11,000 volts: frequency, 50 cycles per second: apeed, 500 r.p.m.: connection, star: excitation, excited singly with direct connected exciter: number, 2. Maker, Shibaura Engineering Works, Ltd.

(*G*) EXCITER OF SYNCHRONOUS CONDENSER.—Type, overhang type direct current generator: capacity, 60 k.w.: voltage, 250 volts: speed, 500 r.p.m.: connection, 2-wire system: excitation, self-excited shunt wound generator with interpoles: number, 2. Maker, Shibaura Engineering Works, Ltd.

(*H*) STARTING MOTOR OF SYNCHRONOUS CONDENSER.—Type, alternating current three-phase wound rotor induction motor: capacity, 300 h.p.: voltage, 3,300 volts: frequency, 50 cycles per second: synchronous speed, 600 r.p.m.: number, 2. Maker, Shibaura Engineering Works, Ltd.

(*I*) SWITCHING AND OTHER APPARATUS.—All the switchboard and switching apparatus was made by the Westinghouse Electric & Mfg. Co., excepting those for the synchronous condenser, made by the Shibaura Engineering Works.

There are one 40-ton and 1-ton overhead traveling cranes for main transformers and synchronous condensers respectively. The former is from the Whiting Foundry Co., U.S.A., the latter from the Tokyo-Ishikawajima Shipbuilding Company.

For testing insulators, etc., two testing transformers with necessary accessories are installed. Description of the testing transformers is as follows:

Phase, single: capacity, 150 k.v.a.: voltage at high-tension side, 360,000 volts: voltage at low-tension side, 2,000 volts: frequency, 50 cycles per second: cooling device, oil immersed self-cooling: number, 2. Maker, Westinghouse Electric & Mfg. Co., U.S.A.

Material for two long-distance telephone lines has recently been shipped from Chicago to Japan by Western Electric Co. They will afford the first modern long telephonic communication system in the Japanese empire, one between Tokyo and Yokohama and the other between Osaka and Kobe. In the two cables are 55,000,000-ft. of copper wire weighing 350,000 pounds. The lead sheath used to encase the copper strands weighs more than 1,000,000 pounds. Cost is about $750,000.

The Far Eastern Review

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A New Japanese Attitude Towards China

AS one result of the prolonged anti-Japanese campaign, foreigners in China may have the satisfaction of calling upon their own governments for protection should the present political and military situation develop into a menace to foreign lives and property. No longer can the foreigner secretly cherish the hope that if the worst should come, Japan will act as the policeman of other nations in China. If internal disorders ever reach a stage where large bodies of foreign troops are required to protect foreign lives and properties, other nations must be prepared to incur the expense of dispatching and maintaining troops and assuming their full share of the after consequences with the Chinese people. Never again will Japan permit herself to be placed in a position where the presence of her troops in Chinese territory can be misinterpreted and so create suspicion and fear of her motives in the minds of the Chinese.

In view of the menacing outlook in the north and the general unstable conditions prevailing in other parts of China, it is well to pause and consider the effect of such a policy on the future relations between China and other countries. The consensus of opinion in Japan, both in official and commercial circles, is that Japan should hold aloof from intervention in China except that which might be absolutely essential for the protection of their own interests, and, even this should be undertaken only as a last resort. If conditions should unfortunately warrant the dispatch of foreign troops for the protection of lives and properties in China, the initiative will have to be taken by the other powers, so that no misunderstandings can be created in the minds of the Chinese as to Japan's position. The diplomatic corps at Peking has warned the Chinese government that in the event of grave disorders breaking out in the north, troops will be dispatched for the protection of the interests of their respective nationals. Restrained by an overwhelming popular sentiment that the time has arrived when a stop must be put to the further dispatch of troops into China and Siberia, the Japanese government will simply follow the initiative of the other powers. The Japanese people are "fed up" with these expeditions, and there is reason to believe, that they would prefer to have their nationals residing in the danger spots in China, concentrated in the ports, than be called upon at this juncture to send any large body of troops into the interior for their protection. They incline to the belief that if China's much discussed sovereignty is to be recognized and her government placed on a secure basis, the Chinese must be permitted to work out their own problems in their own way, free from undue outside pressure.

Highly placed Japanese seem to believe that the struggle between Wu Pei-fu and Chang Tso-lin places them in a most embarrassing position. It is no secret that foreigners have extended material and moral support to Wu Pei-fu, the "Hope of China," because of the suspicion that Chang Tso-lin is an instrument of Japan. These Japanese repudiate any direct connection between their government and the over-lord of Manchuria, who, they assert, has been able to attain his present strong position because of the fact that the provinces under his rule have enjoyed great prosperity as the result of Japanese initiative and enterprise, made possible by the presence of their railway guards insuring protection of the properties against bandit raids and unscrupulous tax gatherers. Chang, they say, is pro-Japanese only in so far as it suits his convenience to be so, the real link of understanding being one of appreciation arising out of the fact that whenever he requires extra funds, the resources of the Manchurian provinces can be relied upon to provide them without undue injury to their productivity. Chang Tso-lin, they declare, is not pro-Japanese or pro anything. Like every other Chinese leader he is out for himself, first, last and always. He is pro-Chang. These conditions have been exaggerated, say the Japanese, into the report that Chang is the instrument of Japan, which has provided foreigners with arguments which inclined them to extend moral and material support to Wu Pei-fu, not because the latter is any more patriotic or less of an adventurer than Chang, but because of their opposition to the spread of Japanese influence in China.

There can be little doubt that there exists considerable justification for the holding of such opinions in Japan, and there are equally strong reasons which justify foreign opposition to Chang Tso-lin. The free circulation of these reports has undeniably contributed to lining up opinion in China on the overworked issue of Japanese domination of the country through control of its government.

This anti-Japanese aspect of the present struggle for power is commented upon by nearly all the leading Japanese newspapers, who see in the warning of the diplomatic corps that the Peking-Mukden line must not be used for the transport of troops, a direct blow to Chang Tso-lin and a corresponding advantage to Wu Pei-fu. The *Tokyo Nichi Nichi* sensing this possibility, declares that if the action is traceable to a desire to assist Wu Pei-fu, it would prove the fickleness of the policies of other governments towards China, and then goes on to emphasize the real point at issue. Foreign intervention in the affairs of China at this time, which in any way obstructs the Chinese from solving their own problems in their own way, by providing undue advantage to any one faction will create a precedent that will deprive China of the advantages secured at the Washington conference. The theory that China's salvation must come from within will receive a rude set-back.

The outlook is not encouraging. If left to the Chinese to settle their own difficulties, it may take many years before the country is unified under a stable government. Foreign support either moral or material to any of the warring factions can serve only to make more difficult the protection of foreign lives and property in the interior. Little reliance can now be placed on the Chinese for such protection. From all parts of the country come reports of utter disregard of the rights of foreigners and refusal to pay adequate damages for properties and lives destroyed. The situation in Harbin has taught them that contempt for the foreigner can be practiced with impunity.

The tendency in Japan to keep aloof from intervention in the affairs of China and permit the warring factions to fight it out amongst themselves is, therefore, well worthy of serious thought. If conditions in this country should ever become so intolerable as to warrant the presence of foreign troops to protect lives and property we may well ponder over the number of divisions that would be required to properly police the territory adjacent to the main treaty ports. If present Japanese sentiment holds good in such an emergency (and there is every indication that they will refuse to shoulder any obligations other than those shared equally by all) it is time that other foreigners should ask themselves where all this is leading to. Japan has been maligned and traduced, suspected and accused of every ulterior motive that human ingenuity could think of, because, in the past, she has taken immediate steps for the protection of her interests whenever they have been placed in jeopardy through Chinese disorders. The Chinese have been carefully educated to believe that in the event of any serious internal disorders jeopardizing the lives and properties of foreigners, Japan would seize the opportunity to flood the country with troops, and,

in pursuit of her policy to dominate China, would never withdraw until the government was firmly under her control. This belief has taken a firm root in the minds of the Chinese, in evidence of which, only a few weeks ago, the Chinese chamber of commerce of Shanghai sent a telegram warning the Peking government against the possibility of Japan postponing the withdrawal of her troops from Shantung on the pretext of maintaining order there should war break out between the Chihli and Mukden factions. The bogey of Japanese armed intervention was calculated to frighten the Peking government into finding, at all hazards, a peaceful solution to the present situation.

The Japanese have learned their lesson. They decline to be made the policeman of China, and in the event intervention becomes necessary, it may be taken for granted that they will refuse to assume any obligation not shared equally by all other powers. Once the Chinese learn that they have little to fear from Japanese armed intervention in the event of internal disorders incidental to political unification; once this overworked bogey is eliminated from the scene, the consequences must strike home to of every thinking foreigner in the country.

We have put China to the test. If she fails to live up to our hopes and expectations and provides cause for armed intervention during the period of unification and reconstruction, public opinion in Japan will insist upon its government holding aloof as far as compatible with their actual interests, and permit other nations to apply their own remedies in their own way. The Japanese have learned that even if they should be called upon at a time of great stress to come to the rescue of foreigners in China, as soon as the danger is passed, gratitude would be replaced by distrust and the same agitators who launched the last anti-Japanese campaign would move heaven and earth to discredit their motives and shift the responsibility for intervention on to their shoulders. If trouble comes, other nations must be prepared to meet it fairly and squarely by the dispatch of their own troops. The people of America and Britain who will be called upon to foot the bills should be told the truth. If armed intervention in the affairs of China is to be the culmination of years of misrule and civil strife, it is well that both Chinese and foreigners alike should thoroughly understand the present trend of opinion in Japan, and prepare accordingly.

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The China Trade Act

It has taken two years of hard work to get the "China Trade Act" into conference. The strongest argument in its favor was the placing of American companies on a plane of equality with those of other nations operating in China, which, stripped of superfluous verbiage, means exemption from federal taxes in order to compete with similarly favored British China companies. The strongest opposition to the bill emanated from the fear of home manufacturers that Chinese capital would incorporate under the law, using American citizens as a means to procure American protection and exemption from both Chinese and American taxation.

The most powerful argument advanced in support of the bill, was based on the favored position of the British companies, and the statement that Chinese capitalists, eager to co-operate with Americans in the establishment of new industries, were restrained from so doing, because they could more profitably invest in the tax-empted British concerns. This, of course, put a decided crimp into any hope of bringing about American-Chinese co-operation in the development of China's resources. The advocates of the bill, however, insisted that the British were favored by a special policy of their government who granted this exemption as a means of assisting British firms to capture the trade of China. In this, we are inclined to believe that a great mistake was made, much time and effort wasted, and the bill placed in jeopardy through misunderstanding, all arising from an immature knowledge of the facts surrounding the British position. The advocates of the bill simply jumped to certain conclusions, and in so doing, injured their own chances of success and placed the British in a false position before the American people.

The British position on tax-emption for registered companies and British subjects in China, far from being traceable to any secret policy of their government to favor its nationals in the fight to dominate Chinese trade, strange to relate, is based on a clear cut principle, one which lies at the very foundation of American liberties and conception of government.

The British position was very clearly set forth two years ago, when the British chambers of commerce in China voted to petition their home government to impose taxation on British firms and subjects in China, in order that they might contribute their share in paying the huge costs of the war. A most patriotic and laudable spirit. However, in the discussions which followed, one of the leading British jurists in China expounded the principles underlying the exemption from taxation and explained that "the proposal to levy an income tax on British subjects in China as a separate tax to be levied by the British government has to get over a great number of difficulties. In the first place we have to recognise that we enjoy extraterritorial rights in China, but no right is given to the British government to tax British subjects in China, which might amount to an infringement of China's sovereign rights.

"You will bear in mind that at present there are no taxes. There are certain fees payable, but all those fees are regarded strictly as fees for services rendered and not as taxes at all. In order to impose a tax on British subjects in China it would first be necessary to assume that such a thing would be allowed under the treaties, because the only ground upon which the king in council exercises his jurisdiction, is ground set out under the foreign jurisdiction act of 1890 for the purpose of carrying out the provisions of treaties."

"The foreign jurisdiction act gives no right to levy taxes and no right can be given to levy taxes, except by parliament. That is very clearly laid down in the bill of rights under William and Mary in 1688. Would parliament ever give authority to the British government to levy taxes on British subjects without those subjects having a right to representation? It is always agreed that taxation without representation is something entirely contrary to the British constitution. We must bear in mind that if we ask for income tax to be imposed on us, we might have to meet, not such a small tax as we contemplate. When once we accepted that tax, we should take a step from which we could never go back and if the government next year liked to raise it to 5s. we should have nothing to say, because we should have established their right to do so. Once we admit the principle, a principle which is outside the British constitution, we admit something which might cause us endless trouble in the future."

After perusing the mass of evidence submitted before the congressional hearings on the "China Trade Act," it is refreshing to read these words from a British jurist, in explaining a principle which influenced the American colonies to declare their independence in 1776. The American people may not understand all the technical trade and other arguments for or against the "China Trade Act," but they can be depended up to grasp in a minute and demand the passage of a bill based on such principles.

It is a sad commentary on American politics that at this late date, we find the British resolutely defending the principle of "no taxation without representation," and adhering strictly to the treaties with China, while these same principles have been overlooked and ignored by Americans in the contest over a trade act, in order to compete with British companies operating on a principle their government dares not defy. There ought to be a lesson in this to the advocates of the "China Trade Act," and if the bill sticks in conference and is unduly held up, it might not be a bad idea to change the tactics and approach congress and the people of the country, on the principle involved in the British position.

The Kiangsi Railway Loan

China's Commercial Honor at Stake

THE Japanese chargé d'affairs recently dispatched a note to the Waichiaopu urging the payment of three instalments of overdue interest on the Kiangsi Railway loan, adding that unless paid by August, the creditor, the East Asia Development Company, will be obliged to take over control of the line in accordance with the terms of the loan agreement. This railway, about 80 miles long, connecting Kiukiang with Nanchang, the capital of Kiangsi province, has been in constant financial difficulty since its construction was first started. The amount owing to the Japanese company is about $2,500,000 silver, and owing to mismanagement and the other mal-practices peculiar to the operation of private Chinese railways, the company has been unable to pay the last instalments of the interest due. With the menace of foreclosure and Japanese direction, the officials of the company have been active the past year in attempting to raise funds to meet their obligations. The line itself is merely the first section of a provincial system, the concession for which is held by the company under a provincial charter, and cannot be expected to pay until extensions are built south and east from Nanchang, connecting the Yangtze with Canton, Swatow or Foochow. It was proposed last year by the president of the company that a new and larger loan be entered into with the Japanese in order to absorb the old one and provide for these extensions, but apparently, the latter are in no mood to advance further sums, under the present administration of the line and the unsettled political conditions prevailing in the province.

Unless the Chinese can raise the funds to meet this obligation, the warning of the Japanese chargé d'affairs, indicates that the creditors will, after a due period of grace, proceed to take over control. This is the only instance where a Chinese railway in operation has been mortgaged on the security of the physical properties and revenues of the lines. In all the old railway agreements, in order to eliminate the possibility of foreign control in the event of default, the Chinese allocated other revenues as security for the loans. In the Pauling and Siems Carey contracts, the line and revenues are pledged, but as these remain on paper, the issue of intervention on default of payment of interest has never before arisen. Here we have a case that will test the sincerity of the Chinese towards these matters. The onus of taking over control of a Chinese railway, with all that this implies in the minds of the Chinese towards their sovereign rights, will have to be borne by Japan, and it is to be expected that any step taken to execute the terms of the contract will be misinterpreted and the truth distorted in order to create suspicion of Japan's motives in the minds of the Chinese. The situation is, therefore, one of considerable interest to all concerned in the development of China, especially at a time when Sir Charles Addis, head of the British group in the consortium, is advocating the opening of negotiations with the provincial governments as a means of solving the present consortium deadlock. Provincial revenues, like all those pertaining to Peking, have been diverted into the pockets of the *tuchuns*. In many instances, taxes have been paid in advance for a term of years, in order to satisfy the craving of the insatiable military satraps. An example of how far the receipts from legitimate taxation have fallen off in the provinces and municipalities is seen in the publication in our February number of the budget of the city of Canton. Out of a total budget of $2,000,000, twenty-five per cent. is derived from the "sing-song" girls, and fifteen per cent. from the rickshaw coolies, a total of forty per cent. from sources that indicate in no uncertain manner, the desperate need for revenue. If this is the condition in a city which, we are assured by all competent witnesses, is a model in municipal government in China, what must be the conditions in other cities dominated by grasping military chieftains ? It would seem to indicate that reliable provincial and municipal revenues that might serve as security for railway or development loans, are difficult to find.

The issue involved in the payment of the Kiangsi Railway loan is, therefore, one that should merit the close attention of foreign financial interests. The province, to all appearances, is sucked dry. It cannot come to the aid of its own railway. The central authorities are in a similar plight. Foreclosure, or foreign control of a security, has to be faced. It is the only tangible asset left to the Chinese on which they can hope to interest foreign capital in their development. If, when the time arrives to take over control on default of payment, the Chinese object, what then is left for them to offer as a guarantee of good faith ?

The treaties entered into as the outcome of the Washington conference relieves China from any fear that the Japanese government or its private enterprises will harbor political designs in pressing for their just rights. The old fear of political penetration through control of railway lines cannot now be fairly advanced as a reason for the non-compliance of the loan terms. The contract rests squarely on its merits as a business proposition, and cannot be shirked by an appeal to political passions. The future of foreign investments in China is at stake on the outcome of this situation.

* * *

The Railway Aspect of the Consortium Organization for China

(*Contributed*)

FROM the railway point of view, realization of the consortium ideals will bring to China the following desirable changes:—

The total abolition of spheres of influence, the provision of an adequate railway system, and improved methods of operation with its corollary standardization.

These results are contingent on the assumption that the consortium terms will be accepted by the Chinese government. Until then, interest in the consortium must remain academic. At present, China shows no inclination to agree, considering her sovereignty endangered by the demand for supervised disbandment of her army, an absolute necessity for the security of any new loan.

That the sovereignty agitation is inspired, goes without saying, as disbandment means an end to the clique of military autocrats now ruling the country. There is no means of coercing these brigands, who, blind to China's interests and bent only on amassing vast private fortunes, are fast ruining the country by maintaining troops out of all proportion to the country's needs. China is perpetually on the brink of civil war as her soldiery owe allegiance only to the men who maintain them in licentious ease, men who would not hesitate to use this power for purely private ends. China is in a condition of rampant feudalism and nearing a first-class catastrophe. There must be a limit to increased taxation to support the armies, and with the new solidarity in financial matters which the consortium spells, there will be no chance for the honest broker among jealous and greedy powers such as gave Tang Shao-yi his opportunities in the first consortium negotiations of 1912-13.

In China, as elsewhere, the natural corollary to an empty treasury is mutiny, revolution and the rise of a strong man. Bankruptcy also implies more stringent foreign control of such organizations as the customs, salt gabelle, and certain railways built with foreign loans.

The hopelessness of the financial situation needs no emphasis, when it is recalled that China has recently defaulted in the matter of a comparatively small loan made by American finance. It would appear, therefore, that the consortium terms must be accepted sooner or later. These terms would embrace disbandment of the standing armies; re-union of the North and South and assignment of part of the loan to the South ; supervision of loan expenditure by consortium representatives ; pledging of the salt gabelle and customs to guarantee repayment.

This article pre-supposes the creation of a railway service somewhat on the lines of the customs and salt gabelle, a logical corollory of the pooling of the various national interests. The original proposals emanating from Chinese sources were for the consolidation of the capital of the various foreign-built railways into one joint loan, indicating that this idea would not be repugnant to China. In this case, everything would be centralized in Peking under one man to the lasting benefit of the country and the elimination of much unnecessary personnel from the conduct of railway affairs. If the consortium is bent on assisting China to rehabilitate herself, foreign control of the railway policy must be insisted on. Foreign direction is needed to see that there is no unnecessary railway construction and also to ensure the proper development of, and additions to, existing lines out of revenues.

At present, the vital railway needs of the country are limited to the completion of the Canton-Hankow Railway, in order to unite the North and South, prevent the recurrence of further factional disturbances and open up a district of vast industrial possibility. The Hankow-Szechuan Railway is equally important to the general welfare, for the better maintenance of law and order in the isolated province of Szechuan and for the development of that enormously wealthy province. With these two most expensive projects completed, attention should be turned to the development of a national steel industry, simply from the point of view of obtaining cheaper steel for railway construction. When it is recollected that fully thirty per cent. of the pre-war cost of railways in China was for products in which steel is the essential material and that this ratio will now be more than doubled, the importance of this development needs no urging. China should be able to produce the cheapest steel in the world. At present nearly all the ironworks in the country are either mortgaged to Japan or in Japanese hands and Japan herself needs all their output.

Lastly, from a purely humanitarian point of view, the regulation of the Huai River, and the conservation of the Grand Canal and Yellow River are of first-class importance as they constitute in their present condition a perpetual menace to the lives, property and crops of many thousands of people.

With the completion of these very urgent projects and the inauguration of an era of most rigid but wisely directed economy, it is believed that China, could, from the profits of the railways in existence, very quickly create an adequate railway system. Foreign direction, and above all, strong governmental support of that direction, are an absolute essential, unless China can produce a man worthy of consortium trust.

Spheres of influence, now happily eliminated by the Washington conference, have cost unhappy China untold millions for railways alone, for these must now be constructed at a cost vastly increased by war conditions, while the delay to education and the advent of that era of profound peace so absolutely necessary for recuperation cannot be estimated.

With regard to the question of an adequate railway system, the following figures are instructive as comparisons with other countries; the Indian figures being particularly striking as conditions and needs are somewhat similar.

The total mileage of railways of all classes, government, concession and private, is 6,836, giving for exch mile of line a population of 100,000 people and 460 sq. miles of territory. The United States has for each mile of railway 3,800 people and 12 sq. miles of territory, while India has 8,600 people and 40 sq. miles of land for each mile. Thus, to bring China up to Indian standards, China has yet to construct some 29,000 miles, a figure giving some idea of the colossal nature of the consortium undertaking and its possibilities for world trade.

The above comparisons do not, however, represent the true position *vis-à-vis* other countries, for elsewhere road construction has gone hand in hand with railway construction and with the vast development of motor traction are increasingly used as an adjunct to railways. China, however, is entirely without a road-way system and its need of railways therefore all the more urgent, from every point of view.

To the handicap of bad roads, must be added the hampering effect of many dialects, the presence of numerous *likin* or native custom stations each levying a dole fixed by the needs of the local magistrate ; and the risk of pillage by banditti, ever on the increase since the revolution. The following statements will cause no astonishment. Outside the railway zones the grossest superstition still prevails which can be, and is, often worked upon to retard progression. Ignorance is appalling and abysmal, and the outlook of the country people limited by the exigences of a grinding poverty and the struggle for the barest existence. Only purely local needs are manufactured for ; standards of length, coinage and capacity, vary from village to village and there may be surplus in one district and famine in the next. There is no patriotism of a large kind and village welfare is of such paramount importance as to obscure all larger issues. With no press or politics the outlook of the coolie class is limited by interests of birth, marriage, death and above all, crops. These factors in the Chinese problem need serious consideration by those who would embark on development work in China. For such, strong government backing is an absolute essential to success, as the unhappy fate of many past enterprises proves.

On the question of improved operation, the following facts are illuminating. Thus, in the board of communications' (1919) report it will be found that 16 railways are concerned with a total mileage of 3,750. For these there are 17 practically separate administrations, the Tientsin-Pukow Railway having two as the line was constructed under a joint Anglo-German loan as traversing two spheres of influence. Yet the total mileage of the whole line is 688. There are other more flagrant instances such as the Tao-kow-Chinghua and the Chengtai railways with mileages of 95 and 151 respectively, which obviously should rank as branch lines, were it not for loan agreements which demand independent administration, an expensive and absurd arrangement which centralization following Consortium control will eliminate. Contrast such practice with the Cape government system with 9,500 miles under the control of Johannesburg.

As regards the board of communications itself, the following reform should result as a corollory of consortium control. At present, the position of board officials and many more prominent outside railway employees, is assured only so long as their party remains in power. With a new cabinet, in all probability there will be a clean sweep of the old *régime*, a procedure not calculated to promote either efficiency or intelligent interest in the work of the board and eminently conducive to corruption. It must be remembered that an official once out of employment is, caste and face reasons aside, not often fitted for commercial life—the only prospect open to him. He must, inevitably adopt *carpe diem* tactics while in office to the exclusion of all else, for official pay of all but higher posts is totally inadequate to acquiring a competence. The present system cries for reform and the creation of a picked permanent staff in such a specialised department as the railway board indubitably essential.

Again, with regard to board railway policy, a radical change is essential. At present, the railways in operation are starved of all but vital maintenance needs and there is consequently no development of open lines, every one of which is capable of handling a vastly increased traffic, which the building of feeder lines would ensure. No single railway* in the country has yet reached the maximum capacity for single line traffic, yet no branches are built. During the year 1918, the profit on the government railways was over 33 million dollars, over 10 per cent. on the invested capital, yet the mileage added during the year was only 18. Previous years would not exceed this and although years of war, the contrast with Indian (pre-occupied with the creation of a railway system for Mesopotamia) is singularly unfavorable. During the years 1914 to 1918, the mileage of the railways of India was increased by 1678, this in a country with a well-established road system and no such crying need for better communications as China.

*The Peking-Mukden Railway is being double tracked over a length of 80 miles.

This stagnation is in no sense the fault of the board but merely a corollory of *tuchun* or militaristic government which makes insatiable demands on every source of income. Thus, in the budget for July 1919 to June 1920, totaling some 645 million dollars, military expenditure is estimated at 40 per cent. Anyone with any military knowledge or even a laymen who observed the conduct of Chinese troops in the recent factional fight between the Anfu and Chihli parties, would have no hesitation in condemning the vast majority of China's army as an undisciplined rabble, totally devoid of every quality making for military efficiency, skilled only in the gentle arts of pillage and senseless destruction, bashibazouks without the redeeming quality of a fierce courage. Rigidly supervised disbandment of these uniformed pests is a necessary preliminary to all reform and the first great work of the consortium will be to terminate this useless and wasteful swashbuckling and ensure that a non-military country, where all progress hinges on communications, is not in future disgraced by a budget which allocates one per cent. of its receipts to education and ¾ per cent. to industrial development. In future, railway surplus must be earmarked for railway development.

To similar causes must be ascribed the rolling stock shortage which is still acute. The railways as a whole are hopelessly under-equipped when contrasted with Indian and other railways and the tonnage offering is continually on the increase. The table shows the contrast in this respect between India and China for three principal lines:

India	Wagons per kilometre	Engines per kilometre
Bengal-Nagpur	5	0.17
B.B. & C.I.	0.42	0.18
East Indian	7.8	0.57
China	**Wagons per kilometre**	**Engines per kilometre**
Tientsin-Pukow	1.26	0.103
Kin Han	1.95	0.137
Peking-Mukden	3.52	0.242

Consortium control will render impossible mismanagement of loan funds such as occurred during the construction of the Ningpo-Hangchow Railway when native companies were allowed to squander £1,500,000 of borrowed money for which the central government was liable, on the construction of a line, which, even with this aid, they were unable to complete and which had eventually to be taken over by the government and handed over to the management of the Shanghai-Nanking Railway for completion and re-construction.

Such wholesale peculation as occurred during the construction of the German section of the Tientsin-Pukow Railway should not be possible in future, together with such diversion of loan funds for industrial purposes as frequently occurred during the war, when Japan financed China without restriction for most questionable considerations. More particularly, the making of such contracts as the car purchase† agreement with Japan on behalf of the Tientsin-Pukow Railway, should, in future, be out of the question, just as much as the creation of monopolies of supply to government departments which was also attempted during the war.

Finally, the question of standardization needs emphasis. As things are at present, though such essentials as render car interchange possible on the government railways have with one exception‡ been provided for, in constructional details generally, the ideas of the country financing the enterprise have as a rule prevailed. The consequence is that each administration has its own standards, a factor tending to restrict car interchange, as repairs are not feasible away from the home line. This tendency to multiply standards has been accentuated by the recent war which made America the only possible market, and though, as a rule, efforts were made to preserve uniformity, it was difficult to fully meet the required specifications.

Standardization, though most vital in the case of rolling stock, is urgently needed in all departments and a commission of foreign experts appointed in 1919 is now advising the board of communications on this question. With the larger question of inducing conformation to standardization on the concession lines like the Chinese§ Eastern, South Manchuria and Tsingtao Railways, over which there is no government control, consortium pressure will be needed. This last is a big and vital question, as the Chinese Eastern has a gauge of 5-ft. and the South Manchuria a different height of coupling gear which entails transhipment and consequent congestion at junction points.

This indicates the railway and larger side of the work to be done by the consortium, and those who have the true interest of the country at heart will do all in their power to assist an organization whose success offers the only peaceful and permanent solution of the Chinese problem. The first essential to success depends on most rigid control of free-lance finance, which without morals, creed or country, is always ready for profitable fishing in troubled waters.

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Electrical Machinery Markets in Japan

A Promising Outlook

THE development of hydro-electric power in Japan is still in its infancy. Much has been accomplished in utilizing the natural water powers of the empire, but much more remains to be done. The business slump of 1920 brought to a sudden stop many ambitious schemes for the erection of new power plants, and further development has been checked for lack of capital. But with a return of confidence and a brighter outlook, some of the larger schemes are being revived, and we find in the island of Formosa, one of the largest hydro-electric plants in the world being financed and constructed largely by the government. The well-known American engineering firm of Stone and Webster have representatives on the ground negotiating with the Asano interests for the construction of a most important project, the details of which, as yet, have not been made public. Other large hydro-electric enterprises are waiting for the proper time to solicit new capital in order to carry out their huge plans. Amongst these is the Inawashiro Hydro-Electric Power Company, Ltd., of Tokyo, controling the water rights to a chain of lakes emptying into Lake Inawashiro and to its outlet, the Nippashi River. Seven large power houses are embraced within a comprehensive plan for the utilization of the water shed drained by the Nippashi River. Foreign manufacturers of electrical machinery and supplies should give careful study to the trend of this development in Japan, with its tendency to utilize more and more the products of home manufacture. The Japanese have made marked advances in developing their electrical industries, and despite foreign criticisms of the efficiency of their machinery, the truth stands that many important plants are now being operated with equipment made in Japan that in many respects equals the more widely known products of America, England or Germany. The day will, therefore, arrive when foreign manufacturers must face these facts and be prepared to meet Japanese competition in other parts of the Far East.

Machinery that has proved its excellence in Japan will make a strong appeal to other Asiatic people. It is for this reason that we invite special attention to the equipment of the generating plants of the important Inawashiro Hydro-Electric Power Company. The first power house, it will be noted, was equipped throughout with foreign materials; the penstocks from Thyssen & Company of Germany, the water turbines from J. M. Voith of Germany, generators and exciters from Dick, Kerr & Company (English Electric Company, Ltd.) of England, the main transformers and switchboard from the Westinghouse Electric & Manufacturing Company of Pittsburg and the traveling cranes from English makers. In the No. 2 Power House, the penstock was furnished by the Tokyo Ishikawajima Shipbuilding Co., Ltd., the water

†200 30-ton cars at $3 per car per day for 15 years.

‡C.E.R. now a Russo-Chinese Railway.

§The Chengtai Railway which is a metre gauge line—a grave economic mistake for which French engineers are responsible.

turbines by the Kobe Works of the Mitsubishi Dockyard and Engine Works, the generators exciters, switchboard and main transformers by the Shibaura Engineering Works and the overhead cranes by the Tokyo Ishikawajima Shipbuilding Works. The balance of the transmission material and station equipment seems to be about equally distributed between foreign and Japanese manufacturers. As in this instance, so in many others, Japanese-made electrical machinery is supplying the demands of the home market. The efficiency and general finish of the products will increase until they will make a strong bid for the export trade. In some cases, Japanese manufacturers are working under expert foreign supervision and control the patents for Japan of many of large foreign electrical manufacturers. The Shibaura Engineering Works turns out General Electric equipment; a new German-Japanese company, combining the Siemens and the Furukawa interests has been organized to manufacture electrical machinery in Japan under German expert supervision, and it is now reported that the American Westinghouse Company has combined with Japanese capital for the erection of a similar works in Japan.

With the great Kawasaki, Mitsubishi, Kuhara, Mitsui, Furukawa, Takata and Okura interests actively engaged in manufacturing or developing electrical machinery and devices, to say nothing of the many secondary companies, turning out material of the highest order, an intense competition must inevitably arise for the supply of domestic requirements, and with the immense resources at the command of these princely houses, it is to be expected that they will reach out for their share of other markets.

Like Sweden, Japan in time will extend her net-work of electrical power services to cover most of the requirements of her population, creating a home market of such huge dimensions that will enable her to manufacture electrical equipment at costs that must prove a serious concern to others. It is evident that Japanese capitalists are looking ahead to this development, and this possibility explains to a large extent, the desire and readiness of foreign manufacturers to co-operate with them in the establishment of large manufacturing plants.

Aside altogether from the industrial possibilities of electric power development in Japan, the growing requirements of the government railways and tramways will absorb most of the power that can be generated. Huge plans have been drafted for the application of electric power to the railway system of Japan, and as new water powers are harnessed, they will be taxed to meet the demands of industry and local transportation. There are at present over 300 minor steam railways and tramways operating in Japan that will be transformed into electric lines as power is developed.

The Japanese are rapidly organizing their electrical machinery industries to take care of thisg reat domestic demand. Nothing is too big for the manufacturer to undertake, and we find many large generating plants entirely equipped with home-made machinery operating beside others equipped with the best products of foreign factories. Efforts are being concentrated on betterments in workmanship, finish and efficiency, and under the guidance of foreign experts and the stimulus of competition a great improvement may be looked for. It is true perhaps, that during the period of the war, many Japanese manufacturers made the same mistake as manufacturers of other nations, and in the rush to obtain markets and turn out the materials quickly, much inferior rubbish was exported. However, the Japanese manufacturer was not alone in this practice, and now that he has to face the realities of normalcy and the competition of the older established foreign manufacturers, he recognizes that only the best product will win. Their products are improving and much solid progress has been made, especially in the initial work of improving their plants, bringing them up to date with the addition of the best types of machinery. Japan's present problem is the lowering of costs of production, and a general readjustment of wages and living conditions in order to permit its products to successfully compete with other nations. As things stand at the present moment, with the balance of trade heavily against them, the Japanese manufacturer must first face the problem of reducing costs in order to hold his own market. Under the careful and wise guidance of the governor of the Bank of Japan and other high authorities, much progress is being made towards this end, but there is still much to do before prices can be brought down to a level where home products can successfully hold the home market against the flood of competition from better organized and equipped foreign manufacturers. However, it may be accepted that the present situation is only a temporary one, and as the electrical machinery plants are re-equipped with the latest machinery, the expansion of their home market will enable them to reach a basis of quantity production that must materially lower costs and permit them to compete more successfully for the export trade.

Amongst the more important manufacturers of electric equipment in Japan are the following concerns :—

	Established	No. of Workmen	Capital 000's Yen
Shibaura Works, Tokyo ..	June 1894	2,787	5,000
Hidachi do.	July 1911	1,481	
Okumura do.	Jan. 1895	818	10,000
Mitsubishi Shipyard Electrical Dept.	Nov. 1919	1,652	
Kawakita Works	Apl. 1913	750	6,000
Osaka Electric Light Co. Elec. Machine Dept.	Oct. 1897	597	
Osaka Elec. Machine Mfg. Co.	Dec. 1911	253	5,000
Yasukawa Works	Jan. 1917	410	250

Manufacture of telephones and telegraphic machinery and electric lamps :

Japan Electric Co.	July 1889	743	5,000
Oki do.	Aug. 1911	613	2,500
Tokyo do.	Feb. 1912	2,720	6,000
Osaka Electric Co. Lamp ..	Feb. 1907	448	1,000

There are many other smaller manufacturers of lamps and accessories, whose products found only on the home market, cut no figure in the export trade, and who, in the fierce competition with the larger firms are destined to be absorbed. The existing companies have already developed a considerable market for their products in other Asiatic countries especially in China and India. Manchuria and Eastern Siberia are to a large extent part of the home market, but the Japanese have to fight hard to obtain the more important orders not controlled by their own nationals. According to figures recently compiled by the department of agriculture and commerce of Japan, the export of electrical machinery of all kinds in 1914-15 was valued at only Y. 500,000. This was doubled in 1916. In this period, the export of telephone apparatus has increased in value from the negligible sum of Y.16,000, to almost a million, although succeeding years record a falling off.

The following table shows the increase in exports, China and India being the chief buyers (in 1920 for ten months only) :—

Year.	General Electric Machines and Parts Thereof.	Telephone Apparatus and Parts Thereof.
	Yen.	Yen.
1914	450,127	16,320
1915	582,075	48,784
1916	1,446,923	896,143
1917	2,493,000	429,000
1918	3,984,000	420,000
1919	4,443,000	630,000
1920 to Oct. ..	3,983,141	597,380

Import generally fell off in 1915, but began to revive in 1917, lasting until 1920. There was a large increase in 1919 and 1920, in such goods as motors, transformers and dynamos. The follow-

ing table gives the value of the import trade (in 1920 for ten months only) :—

(Values in Yen)

Year.	Dynamos & Motors.	Dynamos coupled with Motor Machinery.	Telegraphic and Telephone Apparatus and parts thereof.
1914	2,407,634	435,470	716,168
1915	501,406	248,129	49,171
1916	391,958	441,897	59,860
1917	1,129,000	583,000	61,000
1918	3,061,000	485,000	91,000
1919	5,245,000	736,000	265,000
1920	4,558,975	588,488	530,529

An analysis of this trade shows the distribution of the imports between 1914 and 1919 (000's omitted) :—

	1914.	1915.	1916.
Dynamos and Motors :			
America..	1,069,312	327,170	219,836
	1917.	1918.	1919.
	1,076	2,975	4,763
	1914.	1915.	1916.
England..	401,050	130,574	95,483
	1917.	1918.	1919.
	49	36	187
	1914.	1915.	1916.
Germany	786,988	22,377	17,533
	1917.	1918.	1919.
	0	1	0
Dynamos Coupled with Motive Machinery :			
	1914.	1915.	1916.
America..	14,321	62,921	247,320
	1917.	1918.	1919.
	490,000	483,000	431,700
	1914.	1915.	1916.
England	265,575	186,208	145,649
	1917.	1918.	1919.
	43,000	0	0
	1914.	1915.	1916.
Sweden	0	0	0
	1917.	1918.	1919.
	49,000	0	199,000
Telegraphic and Telephone Apparatus :			
	1914.	1915.	1916.
America..	20,386	14,327	26,598
	1917.	1918.	1919.
	50,000	74,000	247,000
	1914.	1915.	1916.
England	40,463	28,636	28,559
	1917.	1918.	1919.
	6,000	1,000	5,000

* * *

Who's Crazy Now?

SOME time in 1913, Dr. Sun Yat-sen made public his ideas on issuing paper currency based on the value of merchandise and the necessities of life stored in government warehouses. His friends and enemies alike immediately said he was crazy and whilom advisers seized this opportunity to justify their betrayal of his cause and solidify themselves with the Peking mandarinate. Since then, whenever the occasion arises, these defamers of Dr. Sun, invariably refer to his currency plan as proof positive of an unsound mind.

Well! there appears to be others. No less a lunatic than Thomas A. Edison has sent out a questionnaire to bankers and economists for opinions on a variety of subjects, the most important of which was whether national resources were not a good basis for federal currency. His first question was: " What, in your opinion, would be the approximate market value of a Troy ounce of pure gold if all the governments in the world should demonitize it." e also sought information as to why currency on a basis of fifty per cent. of the value of necessities of life stored in government warehouses would not be sound money, and why the equity retained in the warehouses should not be discounted at commercial banks. If such issues of money are unsound, the inventor asks that the bankers enlighten him why. Phew! Sun Yat-sen all over again. The old inventor who thinks with his head instead of with his feet, has the nerve to put it up to the economists and bankers and requests them to answer.

According to the " Christian Science Monitor " " this perfectly simple inquiry seems to arouse the editorial minds of certain papers to a fine frenzy. Instead of answering the question with facts they resort to abuse. They even refuse to discuss it, expressing wonder that the money question queers the soundest practical minds from Benjamin Franklin to Peter Cooper and from Cooper to Edison and Henry Ford." They apparently overlooked Dr. Sun Yat-sen who seems to be in very good company ; in fact, the company of the most practical men the world has produced.

It will be interesting to read the answers of the leading bankers and economists to Mr. Edison's questions. Coming from him it would seem that such questions are eminently pertinent and should be treated with respect.

Japanese Patent Law

Changes have recently been made in the patent law of Japan which will probably improve the value of Japanese patents and facilitate the obtaining of effective grants. Although Japan has been a favorite country with patentees, yet for a number of years the procedure and results have appeared in the eyes of many to have been very unsatisfactory. Applications have been rejected on grounds which did not appear adequate or the patents allowed did not seem to cover all that the inventor felt that he was entitled to protect.

The new laws were put into force at the beginning of this year, but it is desirable for those having applications at present on file to be aware of the fact that it is generally understood that the new procedure under the recent law will not apply to them. Japan being a party to the international convention, one year is permitted from the date of filling a foreign specification to enable an application to be lodged in Japan. It seems that a patent is to be granted for any given invention to whoever applies first independently of any alleged priority, say of manufacture. The foreign inventor should therefore definitely file his application under the provisions of the international convention, claiming his foreign date which will be effective, and not risk relying on the Japanese date.

Apparently, a single patent under certain circumstances may cover both process and apparatus, but substances made by chemical processes are not patentable. The examiner will make a search as heretofore, but provisions are made for dealing with the examiner's objections, and it is thought that the new arrangements will result in less delay than has been heretofore experienced in the prosecution of Japanese applications. The examiner will not be empowered to reject a case definitely until the applicant has been able to deal with his criticisms. An opposition period after publication of the specification is now to be allowed on the lines of British practice, namely, within two months of the date of publication in the official gazette, and it appears that the examiner shall decide finally on the matter not only on the grounds found in his investigation, but by the result of his study of the opposition.

Re-examination of the application of rejection by the examiner is modified in the new law, and apparently a kind of hearing or trial is substituted with the rejecting examiner a defending party. The case is at this stage considered by a group of several examiners, and it is thought by those in Japan that this course will give much better protection to the inventor than the former system. Among the other provisions there may be noted that working requirements are still made, and there are sections dealing with the grant of compulsory licences. The Japanese patent term is fifteen years dating from the date of publication, and all patented articles must be marked, or no damages can be claimed for infringement.

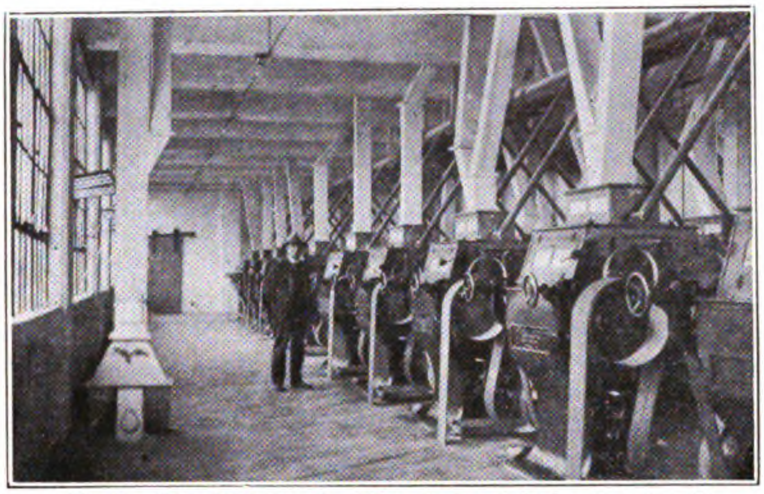
A Three Thousand Barrel Allis-Chalmers Flour Mill in Shanghai

Progressive Chinese Milling Firm Completes a New Plant, The Fourteenth in its Chain of Mills

Editorial Note.—Newspapers in the United States are commenting on the fact that for the first time in history, flour milled in China is being sold in the markets of Europe. Heretofore, the Chinese have been great buyers of American flour, but recently conditions have changed and the Chinese mills are exporting it in large quantities. There are great stretches of land in China suitable for raising wheat, with labor at a very low level. The following article from the *American Miller* on the great Fou Sing flour milling enterprises in China indicates the great advances that have been made by one company in developing its business until now it has a large export trade reaching to Australia and Europe, where its products compete successfully on their merits with the more widely known American, Canadian and Japanese brands.

THE opinion prevails in America that milling is a comparatively new industry in China dating from the introduction of English and American machinery and milling plants in that country. Nothing could be farther from the truth, for Chinese milling is a very old art, and the milling craft ranks high among Chinese castes. To be sure, the Chinese never have been great bread eaters, but the alimentary pastes, such as noodles and macaroni were principal articles of diet long before Columbus set out for America from Spain.

We think of the Chinese as a rice-eating people, and it is true that rice is the chief cereal food of three-fourths of the people. The southern part of China is warm and with abundant rainfall, the soil is rich, and the farmers have handed down their knowledge of agriculture from generation to generation for hundreds, even thousands, of years. They do not know much about scientific agriculture—as a science, but they have found out by experience and practice as a regular thing many of the principles which we regard as new science. Among these practices are crop rotation, fertilization, the use of legumes for supplying nitrogen to the soil, summer fallow, etc. Practically every vegetable, grain and fruit which we are familar with in America is grown in China, and many others besides. In southern China from two to six crops are raised from the same land each year. Most of the farmers are tenants and pay their rent with a large share of their rice crop, but many farmers own their land and are prosperous.



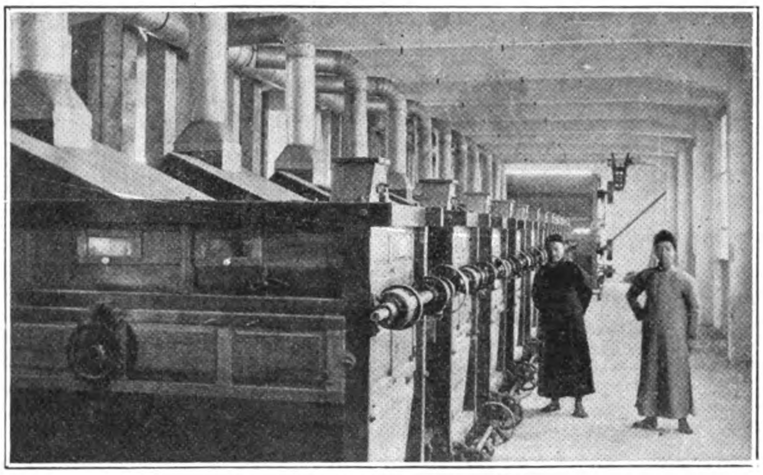
The Fou Sing Mill, No. 7, at Shanghai, installed and equipped throughout with Allis-Chalmers Flour Mill Machinery, sold through the American Trading Co.

But it must be remembered that China, including Manchuria and Thibet, is considerably larger than the United States, being 2,400 miles from north to south and about 3,000 miles broad. Its climate shows even greater variety than ours for the extremes of temperature between summer and winter are more marked. In the central and northern portions conditions closely resemble our grain belt. The soil is largely alluvial, the great rivers bringing down vast quantities of fertile soil each year, much of it being the fine dust which blows for hundreds of miles from the Gobi Desert. Wheat is raised in great quantities and in marked varieties. For instance, Manchuria grows a macaroni wheat of great strength but of poor color for flour; Northern China, or the provinces of Shantung, Szechuan and Honan, grows a white wheat similar to

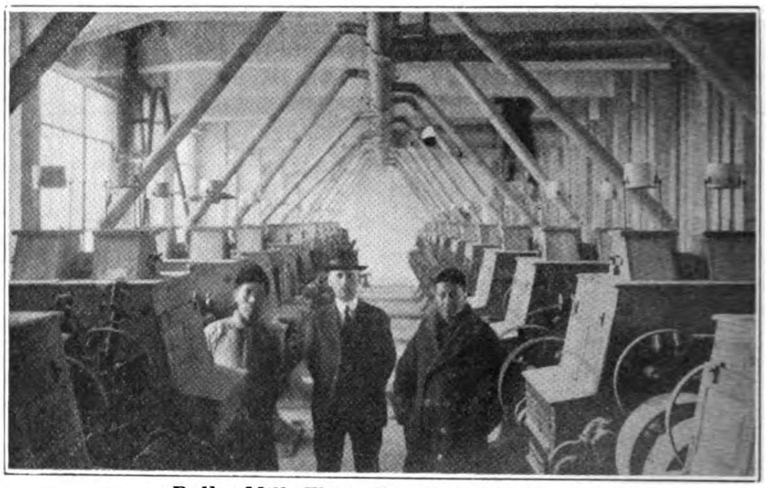
THE FOU SING MILL, No. 7

Grinding Floor

Sifter Floor



Purifier Floor, Fou Sing Mill



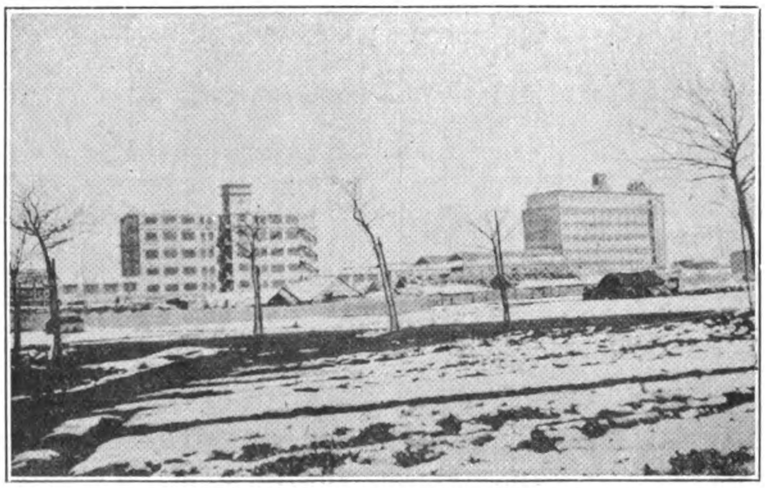
Roller Mills Floor, Fou Sing Mill, No. 8

the Walla Walla, but softer, which is good in strength and excellent color, light in bran and clean and free from impurities. In the central province of Hunan is grown a large red winter wheat called "Hankow" of good strength and fair color, but heavy in bran. In the Yangtze Valley in the provinces of Chinkiang and Kiangse a variety is grown which is called Wusih wheat. It has a small light red berry, fair strength, good color, light bran, and is regarded as the best all-round wheat in China. Wah-Yo wheat is grown in Anhwei province. It is a transparent wheat sprinkled with white berries, very strong in gluten, fair color, fairly clean and light in bran. South of Shanghai there is grown a soft red wheat of good color but very low in gluten.

In the March issue of the *American Miller*, Mr. Sanborn states that Chinese wheat contains gravel or stone, giving the impression that all Chinese wheat comes to mill in that condition. Mr. Akerman, milling superintendent for the Foh Sing Mill at Shanghai, write that this impression is erroneous, for a certain variety of Hankow wheat only, contains stone and has to be specially washed on this account, all other Chinese wheats being quite free from stone of any kind. Mr. Akerman also states that wheat is plentiful and has improved wonderfully in recent years, and that China will soon have to be reckoned with as a flour exporting country.

Now, Mr. Akerman ought to know, for he not only is of milling stock, his father and grandfather being millers, but he went to China in 1899 as assistant miller in the first modern flour mill built in Shanghai. He installed several mills in China and ran them for over 14 years. Then, in 1917, he joined the British army and served in France for two years, rising to the rank of captain. While still in France, Mr. Akerman's services were secured by the Mow Sing & Foh Sing Flour Mills to serve as superintendent of mills Nos. 1, 3, 6 and 7 at Shanghai, The Foh Sing Mill No. 7, which has been completed being the largest mill in China at the present time.

The Mow Sing & Foh Sing Mills Company is by far the largest milling concern in China. They have 14 mills, of which, three are leased. Seven of the mills are at Shanghai. No. 1 is of 400 barrels' capacity; No. 2, 3,000 barrels; No. 3, 1,200 barrels; No. 4, 1,200; No. 5 (now known as No. 8), 1,500 barrels with machinery ordered to double the capacity; No. 6, 1,200 barrels; No. 7, 3,000; and the Yuen Fong Mill (leased) 300 barrels. At Hankow a 1,500-barrel mill; at Wusih two mills of 500 barrels each, the Pao Sing Mill (leased) 400 barrels, and the Tar Loung Mill (leased) 300 barrels; and at Tsinanfu, one mill of 600 barrels. This makes a total capacity of 15,600 barrels of flour per day. And this, remember, is China, the rice-eating country.



Fou Sing Mills, Nos. 2 and 8, at Shanghai

The company was founded and is now managed by T. K. Yung, who is known as the Flour King of China, and one of the most highly respected and progressive business men of that country. W. C. Wong is manager of Foh Sing Nos. 1, 3, 6 and 7 mills. He is a keen business man, alert and progressive and deserved much of the credit for the successful development of the mills under his care. He works in close harmony with Mr. Akerman and together they make a strong combination.

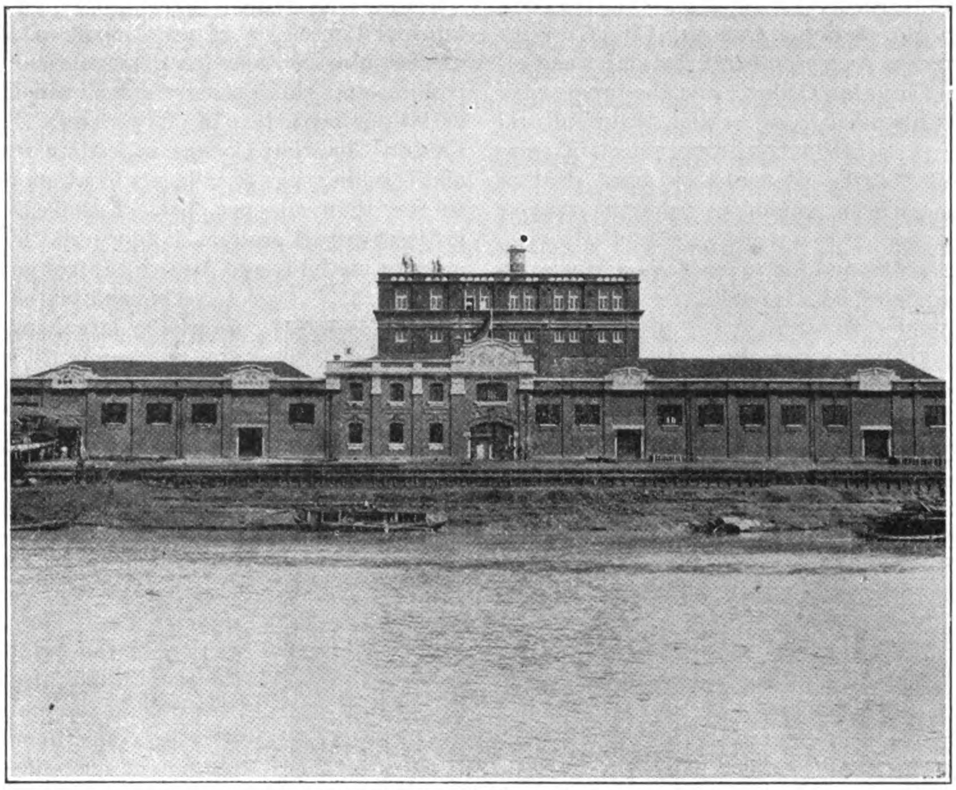
The Foh Sing Mill No. 7 was designed by the Allis-Chalmers Manufacturing Company and the complete equipment was furnished by that firm through its agents, the American Trading Company of Shanghai, China. The mill was built, however, by Chinese contractors and the machinery was installed by native millwrights under the supervision of Mr. Akerman.

The plant is eight stories high and is of reinforced concrete construction with wooden floors. The general layout of the plant includes elevator heads, 22 universal dividers for dividing stock to the sifters, and 12 perfection dust collectors, taking care of the dust from all purifers and elevator suction trunks on the eighth floor. On the seventh floor are 16 No. 1070A Allis sifters, with eight centrifugal reels and nine purifiers. The sixth floor has nine purifiers, eight centrifugal reels, six rebolting reels, four bran dusters, and four short dusters.

The fifth floor is a maze of spouting with little else except fans and dust collectors for the roll suction. On the fourth floor are 22 double stands of 9 by 36 rolls and 27 double stands of 9 by 300 rolls, all of the style A, Allis types. Fifteen stands are used on breaks and 34 stands on reductions. The main shafting and drivers are on the third floor together with flour packer bins.

The second floor is of reinforced concrete, the only floor of this kind in the mill. There are 12 reliance flour packers, elevator boots and an 18-inch belt conveyor running the whole length of the packer row and extending into the warehouse for conveying flour from the packer floor. A portion of this floor is partitioned off and contains roll corrugating and grinding machinery, so that the rolls can be kept

in perfect condition at all times without taking them outside the building. This provision, of course, is not necessary in American mills for here are plenty of well-equipped roll-grinding and corrugating plants convenient to all mills, but in China machine shops are not available everywhere and transportation is so poor that costly delays might be encountered. The first or ground floor of the mill has three reliance bran packers, storage bins for bran made during the night shift and the wood and tin shops. According to Mr. Akerman, Chinese mills either work full time or shut down entirely, and "when working would work Sundays, highdays, holidays and every other kind of days if the miller would stand for it." So there is need for these bran bins so that all bran can be packed in daylight.



The Fou Sing Mill at Hankow

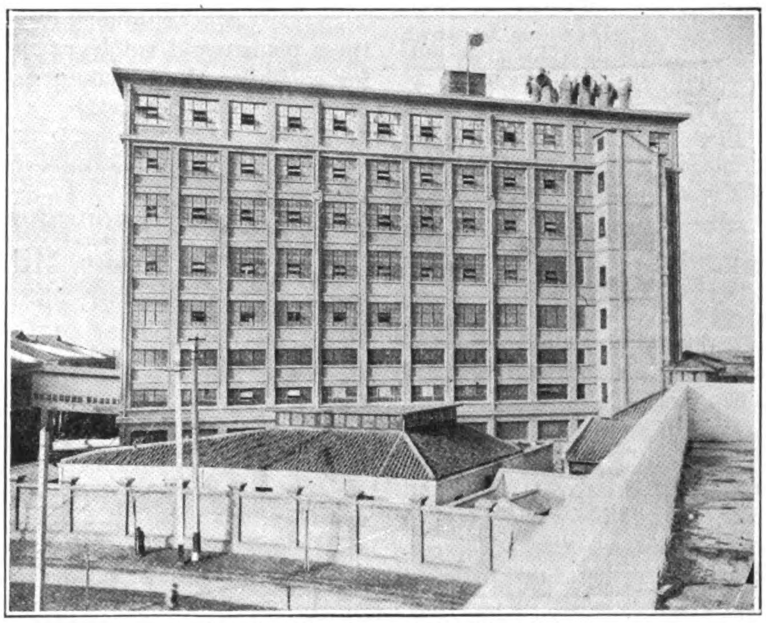
The cleaning department of the mill is in a separate part of the building and is included on all eight floors. On the eighth floor of this department are cyclone dust collectors, dust room, elevator heads and dampening conveyor. The seventh floor has a large double receiving separator, which, with the elevator, is driven with a separate 50 horse-power motor; two first milling separators; two rolling screens; and two iron prince scourers.

On the sixth floor are two large eureka scourers and a second milling separator. Four eureka cockle machines, each of six cylinders, and one second milling separator are on the fifth floor. The fourth floor has three iron prince scourers and four eureka brush machines.

The third floor is taken up with shafting, elevator boots, etc., and the second floor with bagging off spouts. On the ground floor are the conveyors from bins, elevator boots, and the main shaft drive and belts in a closed off room. As will be noted from the cleaning flow, reproduced above, the cleaning process is remarkable for its thoroughness.

The mill is driven entirely by electricity. The motor room is built on the end of the cleaning department and is of reinforced concrete construction. It is equipped with one 1,200 horse-power Allis motor, transmitting power to an $8\frac{1}{2}$-inch shaft carrying two 60-inch belts which comprise the main drives of the mill.

The mill is completely equipped with a sprinkler system, supplied from a 9,000-gallon tank built on the roof, and also connected with a 750-gallon per minute underwriters pump, driven by a 75 horse-power-motor. There is also a 35-gallon supply pump with an air compressor attached for supplying air pressure to the sprinkler system.



Another Fou Sing Mill at Shanghai

In the warehouse a preliminary wheat cleaning plant is being installed with an 80-inch belt conveyor for carrying wheat to the cleaning department. A complete system of portable conveyors and stackers is also being installed for receiving wheat and discharging products into boots. At present this is all done by coolie labor, the men carrying four bags of flour or two bags of bran which weigh two piculs, or $266\frac{3}{3}$ pounds. This labor is all piece work and the coolies sometimes earn as much as $1 (Mex.) per day, equal to 50 cents in gold. This is a very good wage for this class of labor in China, but it remains to be seen if the mechanical conveyors can do the work more economically.

The mill storage consists of three brick warehouses for the storage of wheat in bags with a combined capacity of about 300,000 bushels, and two reinforced concrete warehouses for the storage of flour with a capacity of 500,000 bags. In the mill itself, the milling bins have a capacity of 40,000 bushels and the tempering bins will hold 5,000 bushels.

The plant was started up in October of last year and has been running day and night ever since, and has given perfect satisfaction in its results. The average day's run for the mill is 12,000 50-pound sacks of the different grades divided as follows: 5 per cent. patent: 70 per cent. bakers; 18 per cent. clear low grade; and 7 per cent. red dog. The patents are sometimes turned into bakers and a straight grade made. A recent analysis of the straight flour showed: Moisture, 12.01; ash, .485; gluten, 9.72. Color and elasticity of gluten, good; color of flour, good.

The distribution of the flour is interesting. The patents go to local foreign bakers to supply the need of the foreign population at Shanghai. The straights and bakers go to export, and the low grade and red dog to Chinese consumers.

Chinese mills have done a large export business recently for the wheat control measures in Australia have put the Austr-

(*Continued on next page.*)

The Second Kwangtung Agricultural Exhibit

Openings for Farming Implements

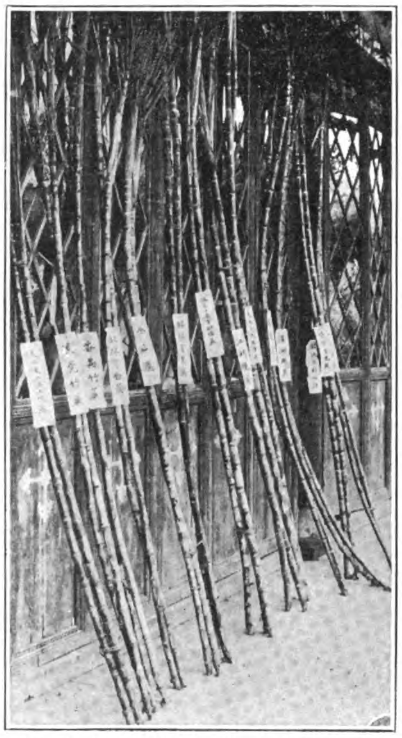
By C. O. Levine

THE second agricultural exhibit of Kwangtung province was held on March 1st to the 10th at the provincial agricultural and forestry experiment station, Canton, China. With the united efforts of the government agricultural station, the College of Agriculture of Canton Christian College, and the progressive governor of the province and his officials, an exhibit of agricultural products was prepared that was a credit to the province, in spite of the fact that the seamen's strike prevented a great deal of material for exhibiton purposes from coming in from the various districts of the delta region.

The exhibit was originally planned for seven days. However, because of the interest shown and its evident educational value, it was extended to ten days. Each day some 15,000 people came to view the exhibits and demonstrations.

The expense of the exhibit was met by government appropriation. The admission was free, so that it was possible for every farmer in the vicinity of Canton to get the benefit of the exhibit. Although it was held at a busy season of the year it was pleasing to note that a large part the attendance was composed of farmers from surrounding villages.

Among the many exhibits those of sericulture, entomology, forestry, cotton, vegetables, citrus fruits, canning, farm machinery, swine, dairy and poultry were of special interest. In the dairy, poultry and swine exhibits were representatives of the shipment of animals from America just received at Canton Christian College. This shipment included Holstein Fresian cattle, Toggenburg milch goats, Berkshire pigs, Barred Plymouth Rock and White Leghorn chickens. All of this stock is of unusually fine breeding, and the animals shown were a valuable addition to the exhibit.



Varieties of Sugar Cane, grown in Kwangtung Province

A Babcock demonstration was made every afternoon to show how buffalo milk compares in fat with European cow's milk. Buffalo cows, which are by far the most common cattle in Kwangtung, give very little milk, but the milk is very rich and nourishing. It contains three and one-half times as much fat as European cow's milk, or about 11.25 per cent. Hence, it especially valuable for cream or butter. It is very palatable although some find it too rich because of its high fat content.

One point in favor of buffalo milk is the fact that buffalos are free from tuberculosis, that dreaded disease common in European dairy cows as well as in the human family. No case of tuberculosis in buffalo cows anywhere in the world has ever been known.

The machinery exhibit, mostly Chinese, American and Japanese, was of unusual interest, and drew a large crowd of interested folks at all hours of the day. The machinery from abroad included plows, harrows, hand seeders, cream separator, churn, cotton gin, pumps and spraying outfits. The large American grain drills, steam plows, and threshers are at present far beyond the farming conditions of most parts of China, but the modern wheel hoe and planter or one-horse (one-cow) machinery will before long be in demand by the more progressive farmers of this and other provinces. In small, simple and inexpensive modern machinery they have part of the solution of the problem of meeting the slow but steady rise in cost of labor.

A part of the sericulture exhibit was a demonstration prepared by the government agricultural experiment station showing improved methods of unwinding cocoons and reeling silk. This exhibit also contained a demonstration showing methods of controlling and eliminating disease, which frequently cause as much as 90 per cent. loss of silk worms. The College of Agriculture of Canton Christian College is leading in silk worm disease control and is selling eggs to villagers in which the disease has been reduced to less than one per cent. of the eggs. Since silk is by far the greatest export product of Southern China, this work of introducing modern methods and disease control is of extreme importance.

The exhibit of fruits and vegetables was unusually large, and showed that the Cantonese are not content with their own scores of varieties of valuable fruits, but are going to America and other countries for horticulture specimens which will add to the large varieties already represented in that locality. Some of the recent introductions are: cauliflower, tomatoes, head lettuce, lima beans, sweet corn; and among fruit trees, the American peach, plum, grape fruit, oranges and other pome and citrus fruits. The horticulture and agronomy section of the exhibit included more than two thousand different entries.

During the exhibit, a test was conducted by the experiment station showing the percentage of sugar in different varieties of locally grown sugar cane. A native press, with decided improvements, was used for this purpose.

The exhibit included material sent in from forty different districts of the provinces, thirty schools, as well as many entries by individuals and business firms.

The Kwangtung agricultural exhibit was initiated in 1916 by Mr. Chu Ching-lan, then the civil governor of the province. It was originally planned to make the exhibit an annual event, but due to political disturbances these plans could not be carried out. Plans are now being made for a similar though more extensive Exhibit in 1922.

A Three Thousand Barrel Allis-Chalmers Flour Mill in Shanghai

(*Continued from page 305*)

alian mills out of the competition, and as a consequence, China has had less competition than formerly. Japanese, Canadian and American flour are all competitors, however. But this new Foh Sing Mill can meet any of them on an even basis for the equipment and operation of the mill are of the most modern types and economies are looked after as carefully as in the best regulated American plants. The Chinese milling company is certainly to be congratulated on its mill and the progressive policy it has assumed, and can look forward to a most successful career.

Egg Products in China

A JAPANESE official estimate in 1919 places the total number of hens in Shantung at 1,500,000 and estimates the annual production of eggs in that province at 126,000,000, or 84 eggs per hen. The exports of eggs originating in the province, including fresh, preserved and manufactured eggs, totaled 91,684,611 in 1913, a normal year. On this basis of 73 per cent. of production exported, the production for all China in 1917 was estimated as follows:

Exports of yolk (29 per cent. of the total weight of egg albumen and yolk exported in 1917, 53,502,500 pounds), 15,515,725 pounds, equivalent on the basis of 50 eggs to the pound of yolk to	775,786,250
Total exports of frozen eggs (4,756,100 pounds) and estimated weight of shell (475,610 pounds), 5,231,710 pounds, equivalent on the basis of 10 eggs to the pound to	52,317,000
Total number of whole eggs, fresh and preserved, exported	247,400,000
Total exports	1,075,503,350
Total annual production	1,473,292,250

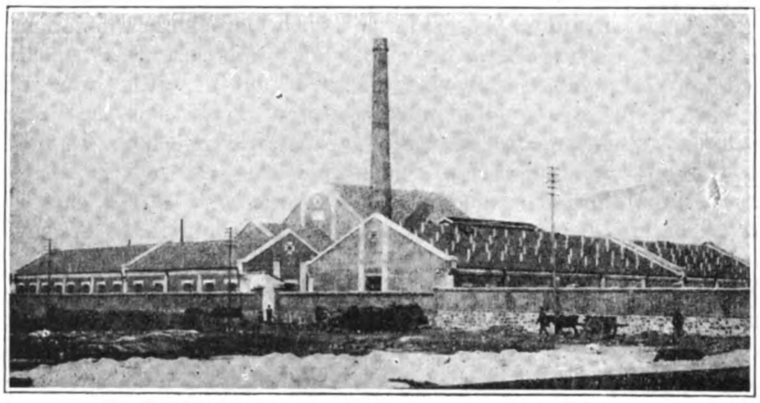
Customs figures, says a recent bulletin of the bureau of economic information, prove the industry to be of considerable importance in China's trade to-day. The following export figures give an idea of the progress registered since 1912:—

Date	*Piculs*	*Haikwan Taels*
1912	125,167	1,984,578
1913	155,973	2,943,956
1914	132,158	2,870,087
1915	199,967	4,864,925
1916	288,346	7,702,403
1917	495,019	11,999,684
1918	289,357	9,307,227
1919	606,182	19,825,098
1920	423,203	11,928,143

The Haikwan Tael has risen in value from 3*s. or* $0.74 *gold in* 1912 *to* 6s. 9½*d. or* $1.24 *gold in* 1920.

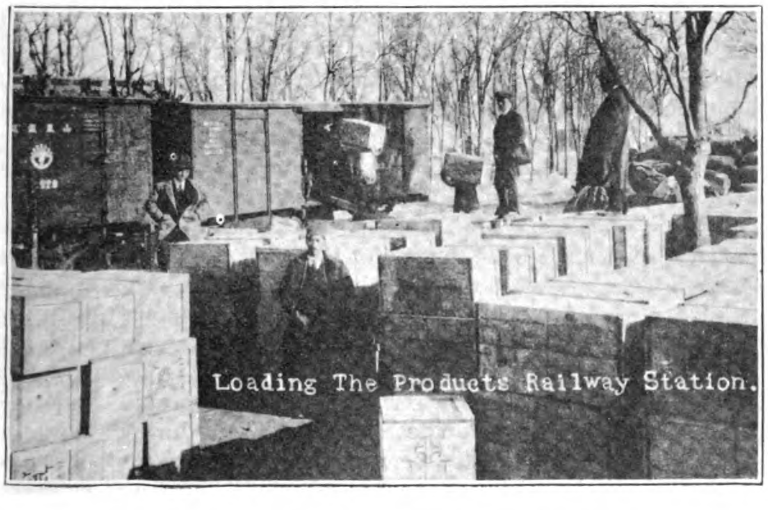
The chief egg-producing districts in China are the provinces bordering the Yangtze and Yellow Rivers, with Hankow, Kiukiang, Wuhu, Nanking and Chinkiang as the centres. Shantung also maintains a thriving industry, computed by a Japanese estimate to deal in 126,000,000 eggs yearly, 75 per cent. of which is exported. These are the principal areas engaged in poultry rearing, but as a matter of fact the trade is general throughout the country, and almost every farmer makes it one of his side-lines. The eggs are sold to collectors who travel throughout the provinces for this purpose.

Egg products as an industry came into prominence before the Sino-Japanese war of 1895. At this time the Germans were the promoters of various undertakings in the Yangtze valley and maintained a first position till the European war. Then the Americans began to take a lively interest in the business, and at the present time nearly four per cent. of the American imports from China are dried and frozen eggs. An investigation conducted in 1920 revealed the fact that there were nine American egg factories in China, this figure being the highest for foreign ownership. In addition, the Americans claim seventeen of the principal exporters of egg products from China, the next position being held by Great Britain with ten. Nowadays, however, the Chinese are displaying extreme activity in controlling the trade. Egg product factories are springing up everywhere, and, although the majority are far from modern in their equipment, the interest that is evident throughout the country is calculated to intensify the present abnormal development.



The Toa Egg Drying Co., Ltd. Works at Tsinanfu, Shantung

Thus it may be anticipated that the exports of eggs from China will not maintain themselves at 1919's high figure. The egg product factories are diverting more and more eggs formerly destined for foreign countries into their own manufactures. It will be a question whether a more extended egg production can keep even the present margin for exports.



Manufacture of Egg Products

The process of manufacturing the principal egg products (whole-egg powder, dried albumen, liquid yolk and dried yolk) is briefly as follows: After thorough cleansing the eggs are broken, and for individual manufacture of albumen and yolk the two are separated. After two or three days of fermentation, during which time the clear liquid settles and is drawn off, the high acidity of the albumen is neutralized by the addition of ammonia. The drying is then done in shallow metal pans, coated with vaseline, in rooms heated to a temperature of 140° F. The dried albumen is put up in tins of 100 pounds net each; these tins are packed two to the wooden box, which weighs 250 pounds gross and measures 7 cubic feet.

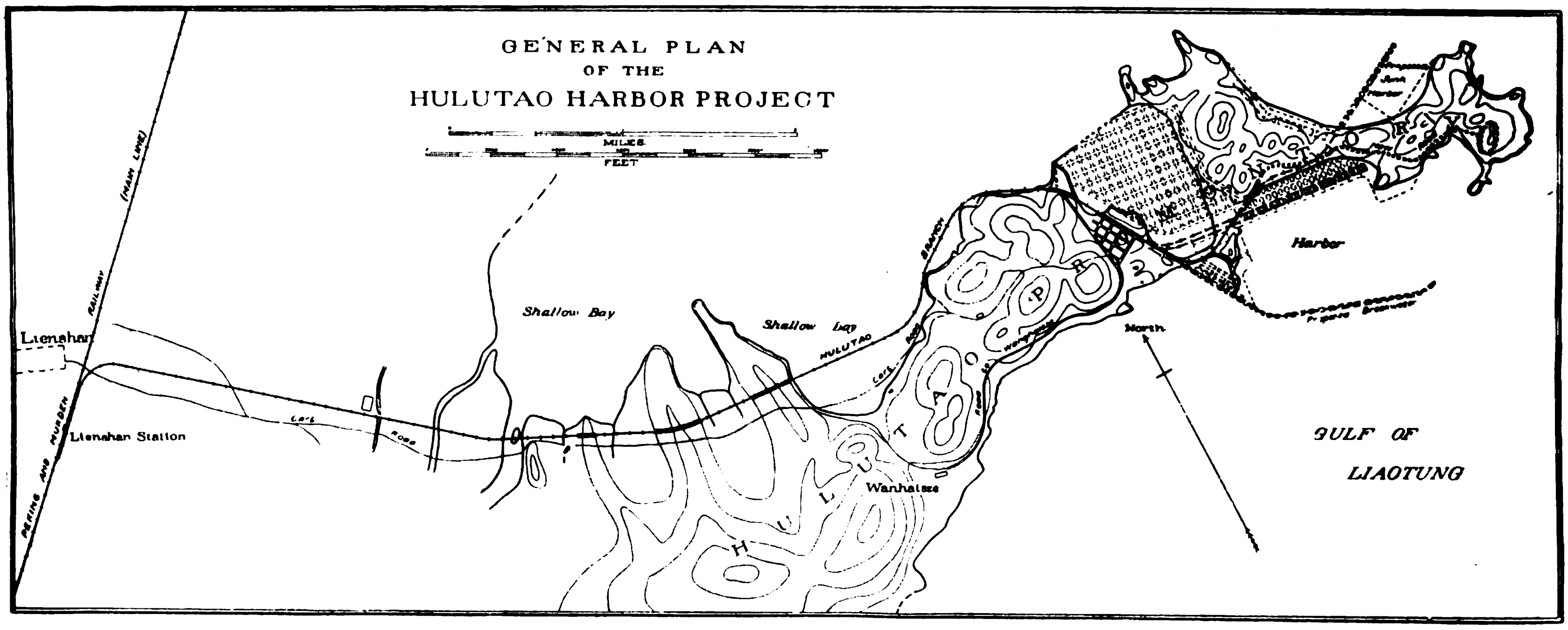
Liquid egg yolk is run through a series of graduated sieves so constructed as to leave the final product in practically liquid form which is treated with either a 2 per cent. solution of boracic acid or a 1 per cent. boracic acid and 9 per cent. salt solution, or sometimes a straight 12 per cent. salt solution, after which the yolk is mixed in wooden drums for 15 minutes. It is shipped in barrels weighing 500 pounds gross and 430 pounds net and measuring 12 to 14 cubic feet. Some factories guarantee the yolk to keep four months from date of shipment.

Dried yolk contains no chemicals and is manufactured by vacuum machines, about 51 yolks being required to a pound of powder.

The Hulutao Harbor Project

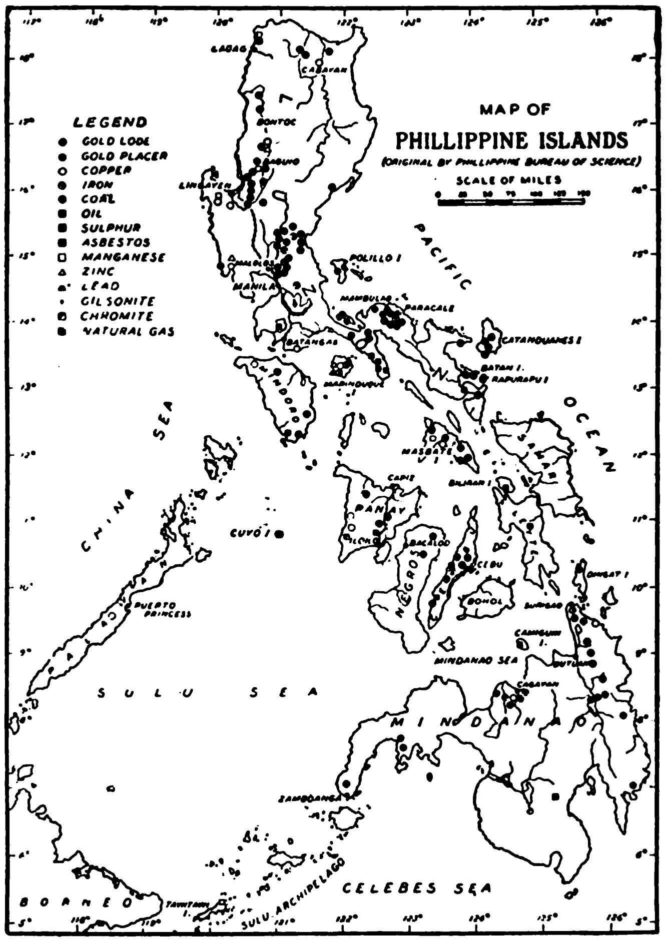
From the Customs Reports

WORK was commenced at the end of October, 1910, and suspended on the 25th October in the following year. In this relatively brief period a standard gauge railway laid with 60-lb. rails was constructed between Lienshan station, on the Peking-Mukden Railway, and Hulutao, a distance of some 7½ miles; for about one-half of this distance the railway is laid on rock embankments or passes through deep cuttings. A cart road over the hills between these points was also completed. A seawall along the shore running parallel to the coast-line at low-water mark was constructed as a protection for the end of the railway line as it nears the breakwater approach, with which it is practically a continuation, as it makes a final connection between it and the base of the rocks forming the mainland. This wall was founded on concrete blocks built into place on the solid rock at low-water level. The blocks are each 30 feet long, and are said to contain 100 tons of concrete each. Two tiers were built for a length of 580 feet. The completed portion of the wall was 18 feet high, and the upper part was made a hollow subway 4 feet 6 inches wide and 6 feet high. Some 100 feet of this subway was constructed to finished level. The breakwater was carried out to a length of 930 feet—350 feet of it being 16 feet high, 350 feet 10 feet high, and the remaining 230 feet 5 or 6 feet high. It is built over a reef of rocks running outward from the shore and is composed of concrete blocks of about 100 tons weight each, built in place and keyed together. A good graded road 20 feet broad in its centre portion was made from Hulutao to Wanghaiszu, a distance of about 3 miles, and it was anticipated that Wanghaiszu, with its picturesque situation and abundant water supply, would prove an attractive locality for private residences, etc. In addition, a pathway some 10 feet wide was made along the face of the hills, forming the promontory at Hulutao, thus giving access to it for its whole length, some 3 miles in extent. The water supply at Hulutao was found to be neither sufficient nor reliable. A copious supply could, however, be drawn from the Lienshan River, some 3 miles distant. Four permanent two-storied buildings constructed of concrete blocks, including an hotel of good appearance containing 19 bedrooms, in addition to dining, drawing and billiard rooms, were completed by the beginning of 1912. In addition, telegraph and telephone lines were laid connecting Hulutao with Lienshan station. When the work was suspended, at the end of 1911, it was anticipatd that another year's work would have advanced the breakwater sufficiently to enable the first ship that arrived to come alongside. In these circumstances it seems lamentable that work costing some $470,000 has been suspended since the end of 1911 and the fruits of previous endeavors left unsupported to battle with the elements. The partially completed seawall now presents a very dilapidated appearance and is seriously broken in parts. The branch railway to Lienshan station, on the Peking-Mukden line, the cart roads to Lienshan and Wanghaiszu, the branch telegraph and telephone lines, all give evidence of neglect during the past decade, and there would seem to be little or no prospect of work on the Hulutao harbor scheme being renewed in the immediate future.



Philippine Coal Supply

A MOST interesting and valuable compilation of facts and figures about the coal supply of the Philippines is contained in a booklet issued by the Manila testing laboratory. During the year 1920 more than Pesos 9,000,000 worth of coal was paid for according to the valuation of this laboratory which has now become of prime importance to the industries of the Islands. Since its inception, the laboratory has analyzed over a million and half tons of coal for its clients, and all the principal coal mines in Australia, Borneo, China, Manchuria and Japan have been visited and the coal sampled. The methods of sampling, analyzing and the laboratory apparatus is the same as recommended by the American chemical society and use by the United States bureau of mines. In the various instances where a comparison was made of the analysis of the Manila laboratory and the government bureau, the average difference in calorific value did not exceed one-half of one per cent. For this reason, and also because of a close agreement between the two laboratories, the analysis of the Manila laboratory can safely be used in bidding under government specifications to the U. S. army quartermaster department. The service performed by this laboratory for its clients consists of drawing and enforcing contracts for the delivery of coal, giving advice and information about the coal market, and assisting the purchaser to secure the most suitable coal for his requirements at the lowest price.



Below are given the results of coal examinations made for the principal clients. The penalties collected, because of the delivery of coal of lower value than the guarantee, due to inferior quality or substitution, averaged P.0.85 per ton, which is more than six times the laboratory charge of P.0.13.

Calendar Year 1920

Name of purchaser.	Tons purchased.	Net penalty collected.	Cost of expert and laboratory.
Iusular Government ..	58,317.98	P.68,801.54	P. 7,581.33
Manila Railroad Company	76,612.01	70,560.59	9,959.56
Manila Electric Company	89,841.61	50,635.49	11,679.41
Total	224,771.60	189,997.62	29,220.30
Per ton		0.85	0.13

Adding to the above tonnage that of smaller clients and also the examinations made for coal companies will bring the total tonnage handled by this laboratory to approximately one-half half of the total imported into the Philippine Islands.

* * *

The source of the Philippine coal supply varies every few years; the product of certain countries rise, flourish and are replaced by others in conformity with economic conditions. The laboratory records contain data on a great many more coals than here shown as many coals from Japan and other countries, formerly sold in large quantities, are not now imported. It was in anticipation of the Australian revival that the writer (who did not come to the Philippines until 1910) visited Australia in 1919 in order that reliable and exact information about all of their coals would be available. From 1903 to 1910 nearly all of the coal came from Australia, amounting to over 300,000 tons in 1908, 90 per cent. of the total importation for that year. When the post-Russian-war embargo in Japan was lifted however, Japanese coal commenced to replace Australian, and, since 1912, has supplied, with the exception of one or two years, 70 per cent. of the total importation, the Australian coal disappearing from the market in 1916. The year 1920 witnessed the first serious attempt of Australia to enter this market again, 130,000 tons being imported as compared to 20,000 tons in 1919; but, owing to government restrictions, it is now impossible to get the best quality, Maitland, and very difficult to get Borehole coals, only inferior coals being offered.

Manchurian (Fushan) coal, from 1913 to 1918 inclusive, averaged 45,000 tons per year, but, owing to other demands, has disappeared from this market, being replaced by Formosan coal, which began in 1918 and increased to 77,000 tons by 1920. Indian coal was first imported in 1919, 5,000 tons, and in 1920, 31,000 tons, but at present there is an embargo on exportations. British Borneo (principally Sebatick) commenced in 1908 and has since supplied this market annually with from 3,000 to 18,000 tons. North China coal (Kaiping field) entered this market in 1912 and has since averaged 50,000 tons per year. From time to time cargoes of coal have been brought in from South Africa, Dutch Borneo, French China and other Chinese fields but have proved to be either of inferior quality or else unsuited to the requirements of this market. Four years of exorbitant prices for imported coal, about 300 per cent. above pre-war prices, have not been able to raise the production of Philippine coal mines above an insignificant figure. This is partly due to scarce, inefficient and expensive labor, but, principally, to physical conditions which only permit of mining on a small scale and make the overhead charge per ton excessive.

The tonnage for the year 1920 given in this article does not agree with that from other sources, but is correct, since it was tabulated from reports made by each contractor of the cargoes that he purchased for his own business. The reports give time of arrival, name of vessel, port of shipment, tons in cargo, etc., and most of these cargoes could be checked by the records of this laboratory.

* The ton used throughout this article contains 2,240 pounds, or its recognized equivalent in the Philippines, 1.016 kilos. The par value of the Philippine Peso (P) equals $0.50 United States currency.

Individual Imports of Coal, 1920.

Contractor.	Tons.	Per cent.
Madrigal & Co.	247,003	39.23
Mitsui Bussan Kaisha	227,121	36.07
Pacific Commercial Co.	52,292	8.30
H. R. Andreas	23,548	3.74
Grimes & Co.	10,180	1.61
Macondray & Co.	8,155	1.30
W. F. Stevenson & Co.	4,901	0.78
Hoa Hin Co.	2,500	0.40
Metzi Bordman Co.	2,041	0.32
Direct importation for private use	15,524	2.47
U. S. Navy (United States coal)	36,399	5.78
Total importation	629,664	100.00

Coal Mined in the Philippine Islands, 1920.

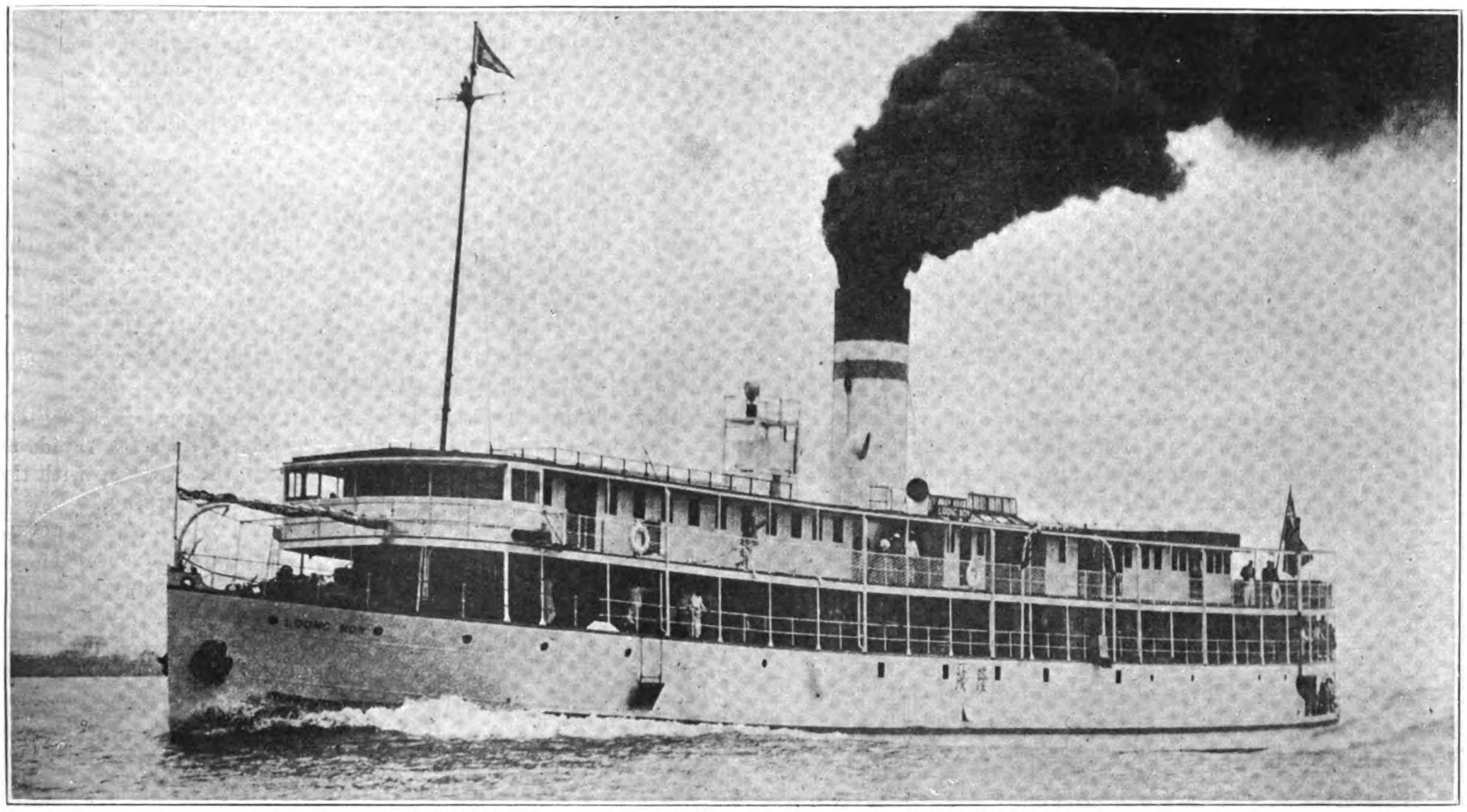
Mining Company.	Island.	Mined at—	Tons.	Tons.
National Coal Co.	Mindanao	Malangas	..	3,075
do.	Cebu	Compostela	2,831	
Uling Coal Mines, Ltd.	do.	Uling	2,978	
J. Clayton Nichols	do.	Toledo	None	
D. M. Carman	do.	Danao (estimated)	2,239	
				8,048
Philippine Coal Mining Co.	Batan	Batan	..	35,000
Total				46,123

Distribution of the Normal Coal Consumption of the Philippine Islands

Consumer.	Tons.	Tons.
U. S. Army:		
Manila		90,000
U. S. Navy:		
Cavite and Olongapo		50,000
Insular Government:		
Manila and Outports		40,000
Railways:		
Manila Railroad	80,000	
Philippine Railway	10,000	
		90,000
Electric Plants:		
Manila Electric Company	80,000	
Iloilo Electric Light Company	4,000	
Visayan Electric Light Company	2,000	
Cavite Electric Light Company	2,000	
		88,000
Cement works (estimated)		6,000
Oil mills (estimated)		10,000
Gas Works:		
Manila Gas Corporation		8,000
Ice Plants:		
Philippine Cold Storage	3,000	
Fabrica de Hielo de Manila	4,500	
Cebu Ice Plant	1,000	
Iloilo Cold Storage	1,000	
		9,500
Cigar and Cigarette Factories:		
Cia. Gral. de Tabacos de Filipinas	2,500	
Germinal	1,000	
La Insular	1,000	
El Oriente	500	
Alhambra	500	
La Yebana	500	
Helios Cigar Factory	250	
La Flor de Intal	250	
		6,500
Breweries:		
San Miguel	5,000	
Oriental	2,000	
		7,000
Distilleries:		
La Tondeña	1,200	
Ayala y Cia.	3,500	
Watson	500	
Los Baños	500	
Ynchausti	700	
Legarda	400	
		6,800
Sugar Factories:		
Silay Sugar Central	1,500	
Ynchausti	2,500	
Calamba Sugar Estate	1,000	
Pampanga Sugar Mills	1,000	
Mindoro Sugar Company	3,000	
San Carlos Milling Company	2,000	
		11,000
Engineering Works:		
Atlantic, Gulf and Pacific Co.	3,000	
Earnshaw's Slipway	1,000	
Sanitary Laundry Co.	1,000	
Colorado Mining Co.	1,000	
San Carlos Iron Works	500	
		6,500
Sawmills:		
Derham Lumber Co.	800	
Insular Lumber Co.	(?)	
Cadwallader-Gibson Lumber Co.	1,200	
Oriental Sawmill	500	
		2,500
House coal, etc.		10,000
Ocean-going steamers		15,000
Coasting steamers		69,800
Steam Launches and Ferries:		
Manila	15,000	
Cebu	10,000	
Iloilo	10,000	
		35,000
Miscellaneous		8,400
Grand total		570,000

Hunchun Improvements

THE road construction bureau, says the customs reports, established in 1919 for the improvement of communications, seems to have limited its activity during the year to the collection of the road tax on carts. On the other hand, the Korean authorities have been energetically pushing the improvement of communication on their side of the frontier. The seaport of Ungi, some 60 *li* south of the Tumen, was opened in the summer to foreign trade and residence and is now visited by the larger steamers of the Japan-Korea coasting lines which formerly terminated their run at Seishin. Also, a road has been practically completed which will greatly facilitate wheeled traffic between Kamisambo, the present northernmost terminus of the Seishin-Huining Railway, and Keigen, a town in Korea facing Hunchun at about 40 *li* distance. Towards the end of the year an electric-light plant was installed in town by a Chinese concern, with the assistance of two Russian mechanics. It supplies light for public and private use, and power is supposed to be also available for operating a flourmill and a sawmill. If successful, the venture may initiate an era of industrial development in the district.



S.S- "Loongmow" on the Measured Mile. Speed 15.1 Knots

Improved Type Shallow-Draft Steamer for Upper Yangtze River

By H. P. KING

THE industrial nations of the world are taking an increasing interest in the development of the natural resources of China, which is becoming to be regarded as the world's greatest potential market for machinery, engineering material and manufactured goods generally, and as a country which can supply the world with vast quantities of raw material. Before these natural resources can be developed, however, China must be furnished with far greater transportation facilities than she now possesses. Great railway projects are under consideration, and will, no doubt, be put in hand once the political and financial conditions in China permit of the safe investment of foreign capital. For the present, however, we are concerned more with the utilization of China's vast waterways and the developments that have taken place during the past few years are very interesting. A very good example is the development of steamship facilities on the upper reaches of the Yangtze River. Not only is this development interesting from the point of view of increased transportation facilities but also because of the technical problems that have had to be solved by marine engineers and shipbuilders before a suitable type of steamer was evolved for the service.

Up to May, 1920, there were four small steamers of a special type plying between Ichang and Chungking, the nearest river port of Szechuan, which is generally regarded as China's wealthiest province. While these four vessels filled a long-felt want they were not sufficient to meet the increasing passenger and freight traffic, and it became obvious that an improved and more powerful type of steamer would have to be provided. The problem to provide this improved type of vessel was not an easy one to solve; this will be apparent when the natural conditions prevailing on the river are considered.

The distance between Ichang and Chungking is about 400 miles, and the rise in the water level between those two ports is, in normal conditions, 500-ft., and, on occasion, may rise to 600 or 700-ft. The depth of water between the end of November and the end of April, when the melting snows in the mountains of Thibet cause the water to rise very rapidly, is insufficient for vessels of more than very shallow draft. The normal current between Ichang and Chungking is generally between four and eight knots, and at times is as high as 13 knots in the rapids. Bearing these facts in mind it will be realized that vessels, to be successful in this trade, must be of shallow draft, of high engine power, and of exceptional steering abilities. Owing to the ever-present danger of striking the numerous rocks in the rapids they must be provided with adequate protection in the shape of watertight bulkheads. It is true that these problems have been solved to some extent for dealing with less exacting conditions in other parts of the world, but nowhere else are the conditions as they are on the Upper Yangtze, and all the more credit is therefore due to those who have successfully surmounted the difficulties that have had to be faced before an entirely satisfactory type of steamer was produced. These difficulties were overcome with careful study and observation, and we give the details of this new type of steamer which has proved very successful on the Upper Yangtze service. This vessel, the *Loongmow*, belonging to Mackenzie & Co., of Shanghai, and built and engined by the Kiangnan Dock & Engineering Works, of Shanghai, completely revolutionized all previous ideas on the subject of steam navigation through the Yangtze Gorges, and proved an immediate success. So much so, indeed, that immediate orders were placed with the Kiangnan Dockyard for four duplicates, and in July last two further vessels of the same type were ordered by Japanese interests.

The vessel is subdivided into nine watertight compartments by eight transverse bulkheads. Passenger accommodation is provided for 16 first-class foreign passengers, 40 first-class Chinese

passengers, 80 second-class Chinese passengers, 100 third-class Chinese passengers, 200 steerage or deck passengers.

The dimensions of the *Loongmow* and her sister ships are as follows :--

Length, overall..	204-ft. 11-in.
Beam	31-ft.
Deadweight (capacity)	400 tons
Speed	15 knots
I.h.p.	3,300

The machinery installation consists of two sets of high-speed tri-compound engines of 3,300 i.h.p., and steam is generated by two Thornycroft boilers working under forced draught and a pressure of 250-lb. per sq. inch. The following auxiliaries are fitted :—

One Weir mono type air pump.
Two Weir feed pumps, with surface feed-heater.
One Weir evaporator.
Independent circulating pump.
Two electric generating sets, one steam and one oil-driven.
Auxiliary steam pumps for general service, fire and salvage.
One steam warping capstan specially adapted to warp the vessel over the rapids if necessary.
Steam and hand steering gear of builders' design for this special service.

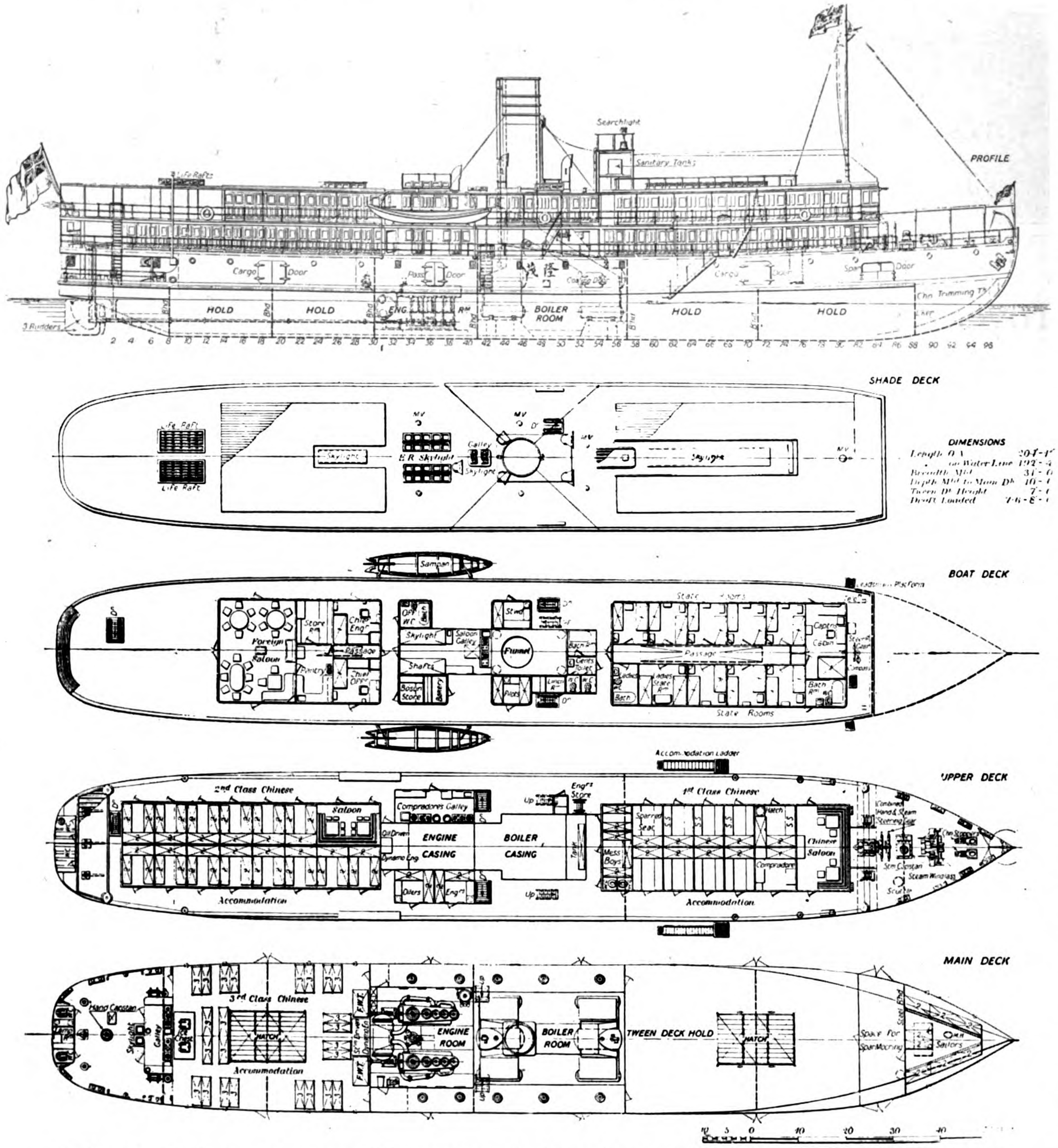
The whole of the machinery and hull were built under special survey of the British Corporation for the survey and registry of shipping, and has the Corporation's highest river classification. The *Loongmow* is understood to be the first ship of this type ever classed by any classification society. Since then the British Corporation has classed four similar vessels, and the American bureau of shipping two vessels of the same type, all built by the Kiangnan Dock & Engineering Works at Shanghai.

The vessels on the service previous to the advent of the *Loongmow* and her sister ships had all to be warped over the rapids at one time or another, but, though the *Loongmow* went up with the highest water level on record she did so without warping.

The actual distance between Ichang and Chungking is 392 miles, and the *Alice Dollar* commenced her service on the run by doing the round trip from Ichang to Chungking and back in four days and 12 hours, this was repeated by the *Kiangking* on her maiden voyage. This record has, however, been beaten since by the *Loongmow* by six hours. The *Alice Dollar* has made the run between Ichang and Chungking in 37½ steaming hours.

The two vessels now building for the Kaiyosha Company, of Japan, are designed to carry 380 tons d.w. on 7-ft. draft, and to steam 14 knots. The steamers are being provided with tackle to handle lifts of five tons.

It is very interesting and pleasant to record that this development in shipbuilding is largely due to the friendly rivalry of Yarrow & Co., of Scotstoun, and the Kiangnan Dock & Engineering Works, of Shanghai.



Shallow-Draught Steamer "Loongmow," for service on the Upper Yangtse River, China. Built and Engined by the Kiangnan Dock & Engineering Works, Shanghai

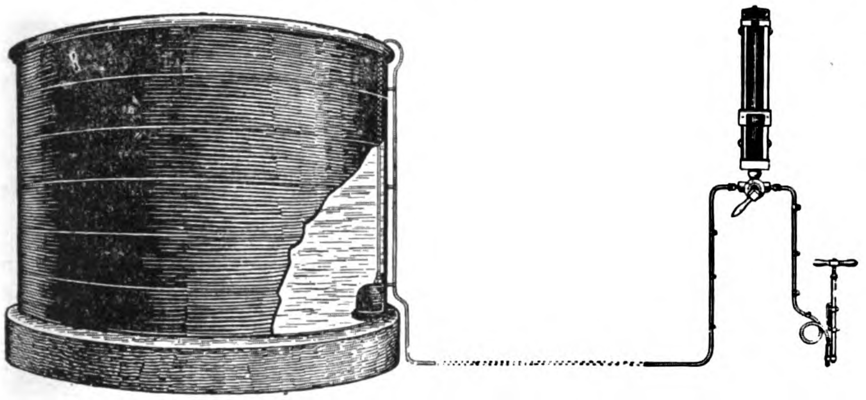
The Pneumercator System

THE pneumercator system has been designed primarily to provide means for the indication at a distant point or station of the quantity of liquid stored in a tank or other vessel.

For example, on shipboard it is employed for the indication in the boiler room or engine room of the quantity of fuel oil in the fuel oil bunkers and settling tanks.

Again in the case of large storage tanks for fuel oil, say on the riverside, the system is applied to indicate the weight of oil in the tanks, the indicating gauge being placed in the office of the superintendent, or other convenient position.

The pneumercator system is an interesting application of the pneumatic transmission of hydrostatic pressure due to a column of liquid to a distant observing station whether the liquid column be the height of a tide, the level of a river or reservoir, the depth of valuable liquid in a storage tank employed in some industrial process, the fuel oil in a ship's bunker, or otherwise.



(1) (2) (3) (4)

Fig. 1. General Features of the Pneumercator Apparatus

The essential features of the normal apparatus are illustrated in Fig. 1.

The inverted hollow hemispherical vessel (1) is fixed at or near the bottom of the tank. In its side a sharp edged orifice is cut which forms the datum or zero line from which measurements are made.

To this "Balance Chamber" as it is styled, a small air pipe (2) is connected and led away to the distant indicating gauge (3). This pneumercator gauge is a robust form of mercury column pressure indicator.

Near the gauge is located a hand operated air pump connected up to the system by means of a control cock (4) which is an important feature of the system.

The elements of the system are of extreme simplicity and the principle of operation is as follows :

Imagine the tank empty and that liquid is pumped in—as soon as it covers the sharp edged orifice air is trapped in the balance chamber.

As the level of liquid rises in the tank the head of liquid above the orifice impresses a corresponding pressure on the imprisoned air, which pressure is transmitted by the small air tube to the mercury indicating gauge. (Fig. 2.)

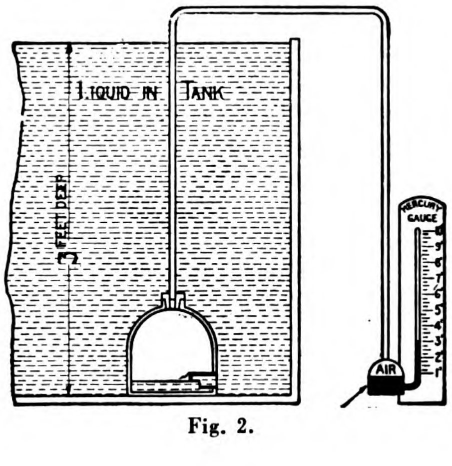


Fig. 2.

The control cock (4) allows of this pressure being applied to or cut off from the gauge or again allows of the gauge being isolated and vented to atmosphere. It further allows of the air pump being connected directly to the balance chamber by way of the air piping (2).

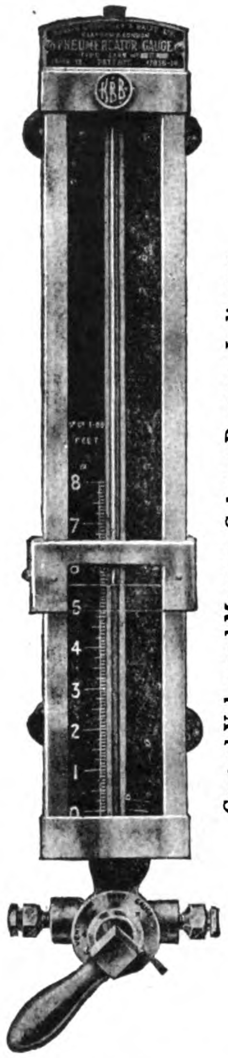
Since, as the head of liquid and consequently the pressure on the imprisoned air, is increased, its volume will decrease, liquid will enter the balance chamber and thus cause a false datum of measurement by raising the liquid level in the balance chamber slightly above the orifice or datum level.

This is overcome by the provision of a simple hand air pump, which, used in conjunction with the gauge control cock, allows of air being pumped into the system so that the liquid in the balance chamber is depressed to the sharp edged orifice and thus the datum in measurement is maintained.

A few strokes of the pump are made before each reading so that all readings are made with a perfectly definite datum of measurement.

During the use of the air pump any excess air pumped in freely bubbles out at the balance chamber orifice and does not affect the datum level. (Fig. 3.)

By means of the control valve the air pumped into the system is deflected past the gauge, so that no air flow through or over the indicating mercury which would tend to exodise the mercury and render it sluggish in the gauge indicating tube, is allowed.



Control Valve and Mercury Column Pressure Indicator

The control valve is now turned to connect the balance chamber to the gauge so that the pneumatic pressure in the balance chamber due to the head of liquid above its orifice (and datum level) is transmitted through the air tubing to the mercury gauge and the mercury column rises to a height exactly equivalent to the head of liquid in the tank.

By putting the control cock to "vent" the mercury chamber as well as the upper end of the indicating gauge tube are opened to atmosphere and the mercury falls to the datum level zero on the gauge scale. Thus the gauge zero can be checked at any time.

The operation of the air pump before taking a reading ensures the correct maintenance of the datum level in the balance chamber. If insufficient air had been pumped in the fact is disclosed by repeating the operation where a higher reading on the gauge will be obtained, thus the gauge is self-checking.

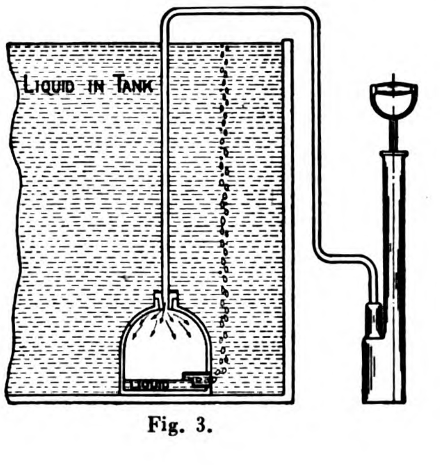


Fig. 3.

Changes of temperature of the air line system have no effect on the accuracy of the gauge. If, for example, the air line is heated up

the air in it expands and the excess volume bubbles out at the balance chamber orifice. If the air line is cooled and the air in it contracts, the tank liquid rises very slightly in the balance chamber, but when the air pump is operated for the next reading the air volume is restored and the datum level regained.

Since the transmitting medium is air only, the gauge may be above or below the tank or at any reasonable distance from it.

The gauge may be scaled not only to read depth, but also weight or volume of tank contents.

The pneumercator system permits of coupling one indicating gauge to a number of tanks where this is convenient, the gauge being connected with any one of the tanks as desired by means of "selector" valves operated at the observing station.

It can be applied to tanks under internal pressure or vacuum, the internal pressure being compensated for by leading a second air tube from the tank top to the top of the gauge column, leaving the actual liquid head only to operate the mercury column.

When desired, the gauge may be fitted with an annunciator by means of which alarms and signals are given when pre-determined levels of liquid in the tanks are reached. The gauge mercury column brings this alarm gear into action, no wiring or contacts at or near the tank being required.

This particular system has been in successful use for some seven years and a large number of oil fuelled ships are fitted with the pneumercator system for indicating in the boiler or engine rooms the fuel oil bunkers and settling tanks.

An installation of particular interest is that fitted on board the R.M.S. *Aquitania*, where some 46 tanks are dealt with.

Another installation of interest is that on board the U.S.S. *New Mexico.*

The applications to liquid measurement in tanks and reservoirs on land have been very extensive and such liquids as

Fuel oil	Ether
Tar oil	Liquid ammonia
Tar	Vinegar
Paraffin oil	Milk
Crude oil	Molasses
Tempering oil	Sulphurous acid
Petrol	Sulphuric acid
Benzol	Phosphoric acid
Alcohol	Nitric acid
Methylated spirits	Caustic soda
Cottonseed oil	Brine solution
Castor oil	Bleach liquor
Linseed oil	Fresh water
Olive oil	Sea water
Etc.	Etc.

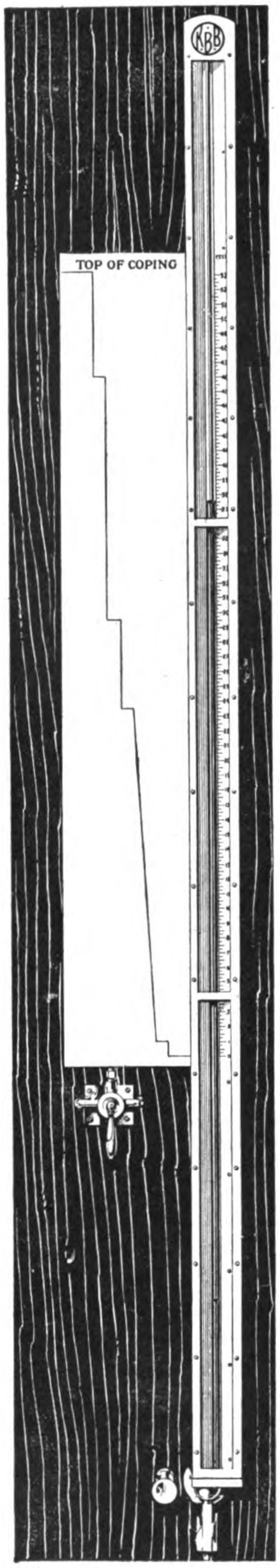


Fig. 4. Pneumercator Guage to Register Level of Water in Filling Dry Decks.

have been successfully dealt with by the pneumercator system described.

In many cases the control of stocks of valuable liquids from the office by having visual indications thereof the quantities in the various distant tanks controlled, has resulted in considerable benefit. Accurate knowledge at all times on the part of those in charge tends to detect leakages and promote efficient control.

Many tanks in factories carrying liquids used in manufacturing processes are difficult of access and measurements provided by the pneumercator system without necessity to visit the tanks and "sound" them have proved of the greatest value in the economical use of the liquids on the part of the employees.

A particular case, that of one of the large superelectric power stations is of interest. The boiler feed tanks were some 50-ft. above the boiler room firing floor and somewhat difficult of access. Several schemes for indicating these tanks on the firing floor were considered, but the mechanical complications rendered these schemes impracticable. By means of the pneumercator system this problem was solved in a most satisfactory manner, the air tubing being run like ordinary electric light wiring.

The case of dry dock control may also be cited. A pneumercator gauge fixed in the pump house enables the pump operator to know at any moment the level of water in the dock. The gauge is sometimes made to give a graphic picture of the state of the dock by means of a profile of the dock (to scale) affixed to the gauge as shown in Fig. 4.

A very interesting application of the system is to indicate in the chart house of captain's room on board ship, the fore and aft draughts of the vessel.

The head of water above the ship's keel operates the gauge which is scaled to show draft in feet and inches and such scale can be read to half an inch.

The precision thus attained is of course very much greater than that yielded by reading the hull draught marks, the observation of which is often very difficult, especially at night.

Construction Work in China

In keeping with conditions obtaining in many other portions of the world, Shanghai, the commercial metropolis of the Far East, was, with the completion of the war, short of housing accommodations. During 1920 twice as much building was undertaken as in 1919, and in 1921 double that for 1920. It is safe to estimate that the equivalent of $50,000,000 silver was put into dwellings in Shanghai during 1921, providing for nearly 500 modern foreign-style residences and probably 5,000 Chinese houses, in addition to much construction in business buildings, warehouses and industrial plants. Next after Shanghai, Harbin witnessed the greatest activity, spending probably $30,000,000 silver in this connection.

Quite in contrast is Mukden, where the South Manchuria Railway during the past few years built in excess of the city's demands, so that to-day scores of modern expensive buildings stand in the Japanese section of the city unoccupied. Tsingtao also figured prominently during the year in construction work. Naturally all these building operations drew heavily on supplies of materials, particularly reinforcing bars, which accounts for the substantial reduction in stocks on hand at the beginning of the new year.

Much building construction has been completed or is under way at Canton. Plans for the improvement of the water front, for the construction of a bridge from Canton to Honam, and for railway terminals, public warehouses and industrial sites are worked out in detail, and overtures are being made to secure the financing of the work.

Work is proceeding on the construction of the blast furnaces at Chinwangtao, capacity 200 tons daily; Lungyen near Peking, capacity 250 tons daily; and Ta-yeh, capacity 500 tons daily. The latter two are being constructed with American materials.

THE FAR EASTERN MOTORS

Supplement to the "Far Eastern Review"
Devoted to the Development of Automotive Interests in the Far East

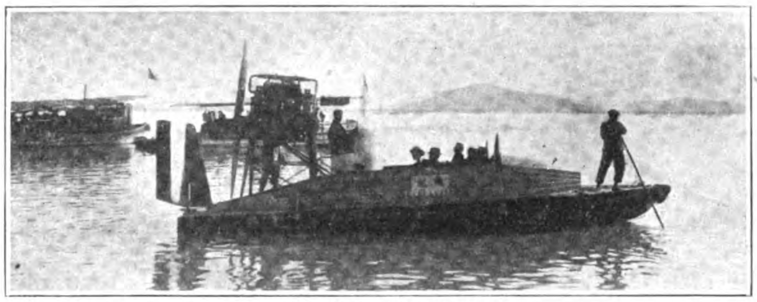
The Hydro-Glider in China

A Dumont-Galvin Performance on the Tsien-Tang River in Chekiang

By Dr. E. L. Tartois

CHINA'S transportation facilities are limited, railways are insufficiently developed and there are practically no roads. The construction of a suitable system of roads and railways will take much time and money, and for some years to come the wonderful net-work of rivers and canals must bear the burden of transportation. With the exception of the Yangtze, which lends itself to steam navigation (although with great difficulties in its upper reaches), all other rivers and their tributaries are filled with shoals and rapids, especially during the season of low water when they are navigable only by shallow draft junks poled or towed with great difficulty by coolies. Two methods therefore present themselves for the proper utilization of these inland waterways for the transportation of passengers and goods: the hydro-plane or the hydro-glider. Although more advantageous than the aeroplane for commercial uses, the carrying capacity of the hydro-plane is too small.

The hydro-glider is a boat of special design driven by an aerial propeller, and whose shape of hull permits it when driven at a certain speed, to lift almost completely out of the water thus avoiding the water resistance, which in the case of an ordinary boat, increases tremendously in relation to its speed. As its name indicates, the Hydro-glider, glides along the surface of the water. The builders of fast motor-boats long ago learned that with an increase of speed the boat lost some of its weight, and by successive trials improved the shape of the hulls in order to amplify this effect. The effect, however, of lifting the bow, plunged the stern deeper under the water by reason of the powerful suction exercised by the propeller. The resistance of the water on the hull increased so rapidly with the speed that even a slight increase was accompanied by a disproportionate increase in power.



The Fei-Long at Zakhou

Finally, the weight of the engine for a determined hull, added to the weight of fuel and the carrying capacity, that these high-speed motor-boats lost all commercial efficiency and became useless except for speed maniacs. The application of aerial propellers to aeroplanes and the hulls of sea-planes brought to light new principles in propulsion, especially the necessity of providing the bottom of the hulls with one or two " nicks " or steps (see Fig. 1). The function of these steps is to break the water pressure in several places, which, otherwise acts as a brake and reduces speed. Therefore, it was determined that aerial propulsion, shapes specially designed to decrease the friction of the water on the hull, with well calculated slopes of the planes, constituted the essential elements for the realization of a successful hydro-glider.

The principal advantages of the glider may be condensed as follows:

1. Sliding along the surface of the water, the glider is practically unaffected by currents, whirlpools or rapids. An ordinary boat going against a current of certain strength will have its speed reduced in accordance to certain formulae too long to explain here. On the other hand, the speed of the glider for the same scientific reasons is slightly increased.

2. Its draft at full speed, being practically nil, the glider can easily navigate streams which even a sampan would find difficult, thus making it the ideal means of passenger transportation and mails on shallow waters, with rapids, a feature of nearly all Chinese rivers.

On the other hand many gliders at the outset had certain disadvantages which limited their practical employment but which have been corrected until the boat is now highly efficient for commercial transportation. Foremost among the types which have entered the field in France and China and given excellent results, is the Dumont-Galvin glider. A description of this type follows:

Its chief characteristic is the new form of the hull, whose lines are very like those of a sharp nosed launch cutting the water. This machine marks the attainment of the goal sought after during a continuous study of its working under conditions corresponding to those actually encountered and is an interesting practical and commercial proportion.

The Dumont-Galvin machine is a fast and light glider, light enough to be hauled on a wheeled truck to its garage in drydock or to be transported on *terra firma* and towered into water.

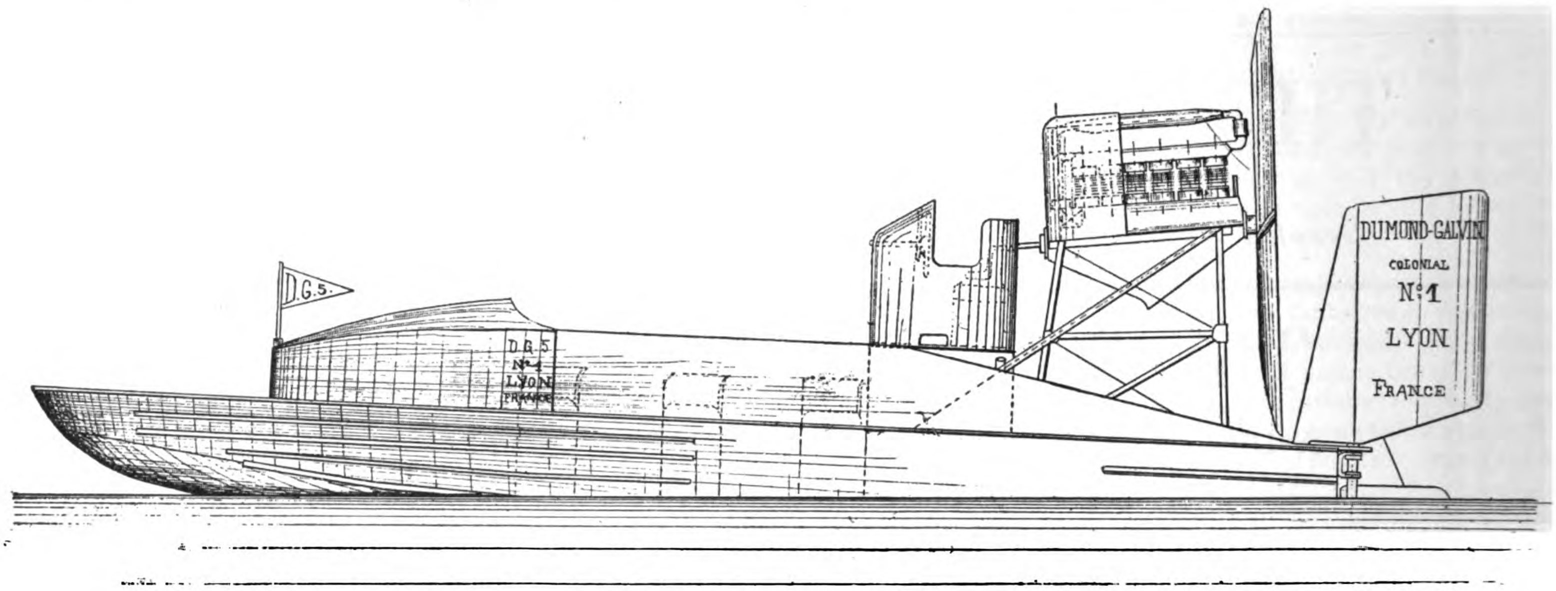
Its corresponds in its class to a large sized motor car, giving the same cost per mile for example.

Provided with a sturdy motor, using crude oil with a very low consumption its non-stop working is certainly more sure than in the case of a motor car, as its mechanism is less complicated and there is less of it and nothing has been sacrificed in its construction to lightness or speed to the detriment of its strength and suitability for commercial uses.

The D. R. type of commercial hydro-glider is fitted with an aerial propeller. Hull of the sea-going model two sheetings of mahogany-bottom copper sheeted to prevent erosion in sandy waters.

Divided into six water-tight compartments, in addition carries four air tanks sufficient to keep the boat afloat in any case.

Length between perpendiculars	30′ 8″
Breadth	9′ 11″
Carrying capacity (deadweight)	1.3 ton
Draft, loaded (stopped)	7″ 3/16
Draft at full speed	practically nil



Colonial Model No. 1 of the Dumont-Galvin Hydro-Glider

Crew accommodation two seats, one for the pilot, who is at the same time the mechanic, one for a sailor boy.

Passengers accommodation :

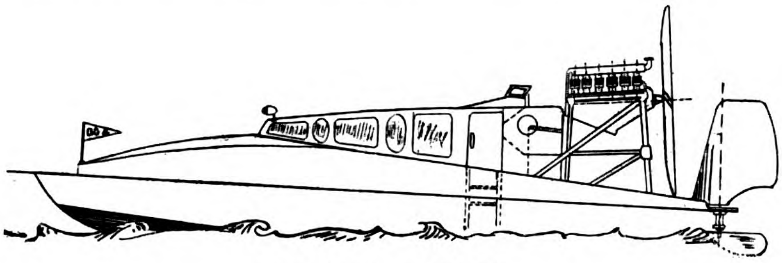
Open cockpit covered by collapsible awning with seats for ten passengers or closed cabin with seats for eight passengers.

Weight, empty .. .. 2,400-lb.

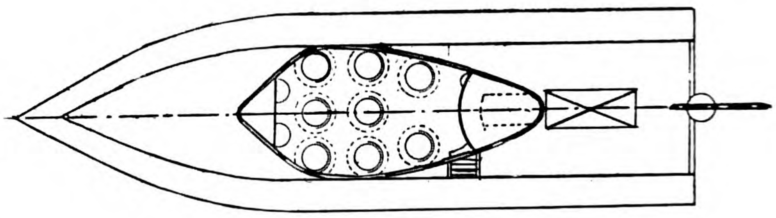
The closed cabin makes an extra-weight of 330-lb. Motor 6 cylinders in line (low compression and low rate of revolution).

The boat is fitted with an aerial rudder and will at full speed turn within a circle of not more than 130-ft. In addition a water rudder (taken outside the water at full speed) is used for steering at slow speed.

The motor is of industrial type and is more reliable than a motor-car engine because of the low compression (50-lb. per square feet) and the low rate of revolution (600 R.P.M.). It does not require any specialist and can be easily put in the hands of a Chinese mechanic.



Closed Colonial Model



Seating Plan of Closed Model

Propeller four-bladed or two-bladed large pitch directly coupled to the motor shaft.

Full power	100 H.P.
Mean power requested	70 H.P.
Necessary speed to alight from water ..	18.6. st. Miles per h.
Commercial speed	28 st. Miles per h.
Full speed (momentary)	37 st. Miles per h.

Capacity of fuel tank sufficient for 11 hours.

Kerosen consumption	7 Imperial G.p.H.
Lubrication oil	1/4 Imperial G.p.H.

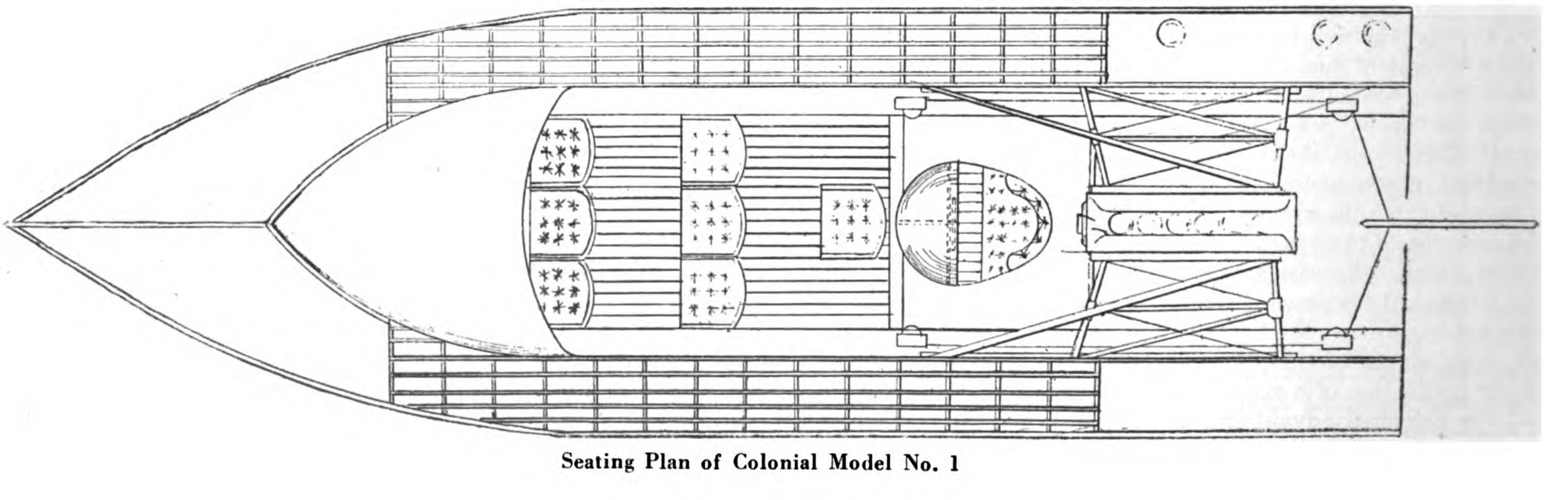
It works for several thousand hours without repairs. It is fitted with two carburettors, double sparking plugs and magnetos. Starting magneto and starting handle.

It starts easily by hand.

It burns Kerosen—a great advantage in China and the fuel consumption is garanteed not to exceed 7 gallons per hour.

This craft is quite different of the others made specially for speed in perfectly calm waters.

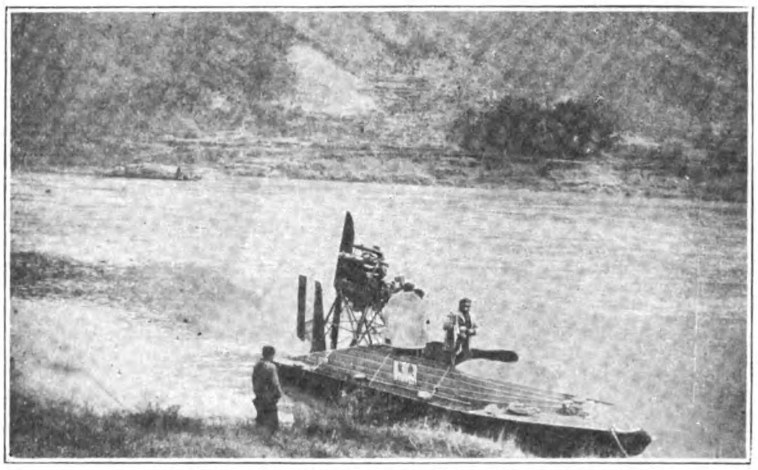
The hull is built on the lines and has the sea worthiness of a sea boat and is quite safe in strong eddies.



Seating Plan of Colonial Model No. 1

It will be perhaps of interest to add that the fact of the machine gliding on the surface of the water does away with the wake formed by a steam or a motor launch although much slower.

A demonstration trip was recently made at the request of Gen. Lu Yung-chang, tuchun of Chekiang, on the Tien-tang River in that province. This river along which is located several important towns, is the main artery of commerce and communication between the southern parts of Chekiang the eastern part of Anhwei and the provincial capital at Hangchow. Steam launches, even the smallest, are unable to proceed further than Tung-lu about 60 miles from Hangchow. Beyond this point, the difficulties begin. The river widens, narrows, shoals and is filled with sand bars, boulders and reefs, with many dangerous rapids. Junks are towed up the river, and at times the coolies have to pull them by main force over the sand bars. Under these conditions, the so-called "express" passenger junks, require at least six days to make the trip from Zakhou, Hangchow, to Chuchowfu and fifteen days to Tungchi, in Anhwei.



The Fei-Long in the Tilung Tang River Gorges

At the trial trip of the Dumont-Galvin glider, notice was served on the Chinese that it would leave Hangchow in the morning and reach Chuchowfu in the evening of the same day. The notice was received with loud laughter.

On the 12th of February fully loaded with 6 passengers, 80 extra gallons of fuel, in addition to the 80 gallons in the tank, with implements, spare parts, food, etc., the whole weighing about 3,000-lb., the glider started on its trip in a storm of rain and hail. The trip was without incident, leaving at the fixed time and arriving on schedule. We give here the log kept by Mr. B. Hemingway of the Asiatic Patroleum Co., who acted as guide and interpreter.

OFFICIAL LOG OF THE HYDRO-GLIDER "FEI-LONG"

12/2/1922.

Zakhou to Chuchowfu via Tung-lu.

7.08 a.m. Left Zakhou.
8.29 ,, Passed Fuyang (90 *li*).
8.42 ,, Stopped for minor engine trouble (dirt in carburettor).
8.47 ,, Resumed voyage.
9.04 ,, Stopped. Dirt in carburettor.
9.14 ,, Resumed voyage.
10.07 ,, Passed Tung-lu (180 *li*).
11.47 ,, Passed Yenchow (270 *li*)
12 noon Stopped to oil engine and for lunch.
12.20 p.m. Resumed voyage.
1.52 ,, Passed Lan-chi (360 *li*)
3.20 ,, Arrived Lung Yu (450 *li*) stopped to pass through pontoon bridge.
3.29 ,, Resumed voyage.
4.55 ,, Arrived Chuchowfu (540 *li*).

Actual time under way, Zakhou to Chuchowfu 9 hours 3 minutes.

14/2/1922.

Chuchowfu to Zakhou, via Tung-lu.

7.30 a.m. Left Chuchowfu. (Heavy rain and strong wind)
9.00 ,, Arrived Lung Yu. Stopped to pass through bridge.
9.05 ,, Resumed voyage.
9.48 ,, Stopped to tighten loose bolt in engine.
9.52 ,, Resumed voyage.
10.30 ,, Passed Lan-chi.
12.09 p.m. Passed Yenchow.
1.52 ,, Arrived Tung-lu. Stopped to take fuel.
2.15 ,, Resumed voyage.
3 ,, Stopped dirt in carburetter.
3.05 ,, Resumed voyage.
3.53 p.m. Passed Fuyang.
5.18 ,, Arrived Zakhou. (Strong head wind between Yenchow and Zakhou. Rough water. Boat behaved beautifully.)

Actual time under way, Chuchow to Zakhou, 9 hours 11 minutes.

Signed : B. HEMINGWAY, Inspector of the Asiatic Petroleum Co.

The only trouble experienced and which could have been easily avoided by taking along a funnel with a filter to fill the tank, and so provided against dirt in carburettors.

The obstacles to an ordinary boat did not exist for the glider. With a draft of less than 1-in., the shallow places did not impede progress and as for rapids, it is impossible to note them.

Making no wash the glider did not disturb, the small craft and as for steering, it is as simple as the driving of a motor car. The glider passed at full speed between native boats and climbed several V shaped rapids without difficulties. The experience gained on this trip enabled the owners to accurately calculate the cost price per ton per mile for freight.

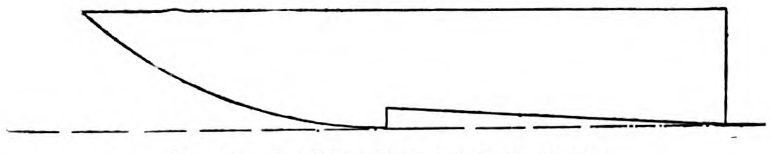
Including every expense: capital, interest, depreciation, repairs, upkeep, insurance, etc., wages of the crew (two men), fuel and lubricating oil, on one side, and on the other side: the efficiency of the boat, weight carried, speed, and hours of utilization, the cost was figured out at Mex. $0.70 per ton mile, or about Mex. $0.07 cents per passenger with luggage per mile.

This price although high, is not prohibitive. It is a little above the cost of transportation by motor car, but much below the cost of transportation by aeroplane. It is out of question to carry coolies in gliders, or to compete with railways or steam boats, but when there is only junks or sampans, the glider is the most economical for the business man with whom time is precious. The price for junk hire is small, this must be added the taels and fatigues of such a trip.

More economical than the aeroplane the glider is much safer, and cannot sink. It is sure to remain afloat. It is easy to steer. Sturdier than the aeroplane, the glider will last a longer time. Its weak point was formerly its aviation engine, too light, too complicated. The substitution of this engine by an industrial type of motor has eleminated this.

Wherever the glider is placed in service, no sheds, no landing places, no roads, or slips are required. The glider can start and stop where it pleases.

It would seem that with its advantages the entrance of the hydro-glider as a means of inland-water transportation, would be welcomed by the authorities. It seems somewhat tragic, however, to learn that the customs officials have refused to grant navigation licenses to these boats, because the treaties do not provide for hydro-gliders navigating inland waters! The demonstrations have, however, interested the Chinese, and by the end of this year regular services of gliders will exist on several rivers, with the certainty that the traffic will increase from year to year.



Showing the "Step" of the Hydro-Glider

Lubrication Its Relation to Engine Wear

Prepared by the Engineering Division of the Vacuum Oil Company

THE erroneous impression has existed for quite some time that after an engine has seen considerable service, the wear produced by such service on the metallic surfaces necessitates the use of oils heavier in body than were originally suitable. Further, that the progress of wear and need for heavier oils may be predicted for all cars on a definite mileage basis.

If we apply the acid test of scientific engineering analysis to this practice, we find that it is based entirely on the following :—

Fallacious Assumption—No. 1

That wear takes place at substantially the same rate in all makes and types of engines under all conditions of service.

This assumption neglects entirely the fact that there are wide variations in the materials used for cylinders, pistons and piston rings in different makes of cars ; differences in design and proportions ; differences in manufacturing processes. It also assumes that all owners will accord their cars the same care.

It must be evident that variations in any of these factors will largely affect the rate with which wear will take place and consequently will make the mileage basis for determining the proper lubricant very inaccurate.

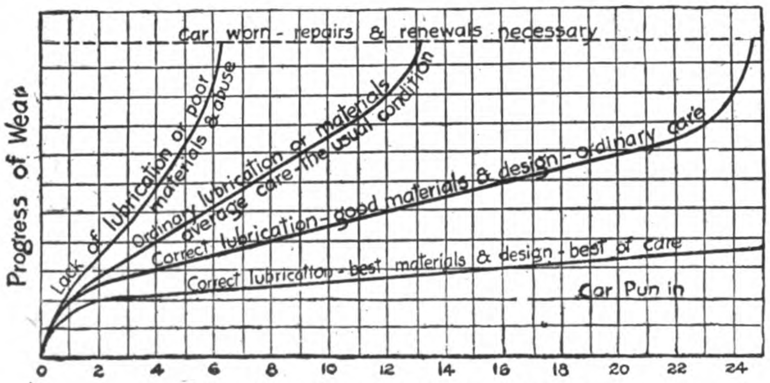
It is well known that the rate of wear of aluminium and cast iron pistons varies widely and that the care exercised in " seasoning " and finishing cylinders and pistons materially affects the life of these parts. Some owners will take no care whatever of their engines and may drive at high speeds. Others will give proper attention to lubrication and drive their cars with care.

For these reasons it must be plainly evident that any system attempting to determine the proper lubricant for all cars on a fixed mileage basis alone must yield results which are wholly inconsistent and not to be relied upon.

Fallacious Assumption—No. 2

That from the time the engine is new, wear is uniformly progressive in proportion to the mileage of the vehicle.

When engines are new, the metallic surfaces in contact with one another are only as smooth as is permitted by the method or methods employed in the finishing of such surfaces.



MIL.S OF SERVICE IN THOUSANDS

Figure 1.—How varying conditions affect the progress of engine wear

The ideal condition would be the lapping in, or finishing, of these surfaces to give them a high polish, completely eliminating all roughness left by the tools used by the manufacturer in production.

The methods usually employed in the quantity production of automobile engines do not permit of highly finished surfaces being secured. Likewise, the time required for producing such highly polished and finished surfaces would necessitate high cost in production and eventually mean higher cost to the purchaser of the car.

Examination by engineering experts of new cars of many different makes has conclusively proven that the engines, when turned out by the manufacturer, are run in only to a limited degree ; consequently, when the car is received by the purchaser, the metallic surfaces are still somewhat rough.

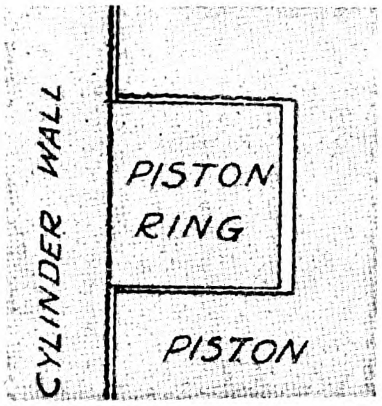


Figure 2.—Emphasizing the roughened condition of cylinder, piston and piston ring surfaces found in new engines.

Because of this it is necessary for the purchaser of the car to operate his engine at moderate speeds and loads for at least 1,000 miles before the rubbing surfaces wear to produce running fits. During this period, however, it is not necessary to use a lighter oil than is correct for the car when run in.

As the parts wear in, there is a slight but nevertheless marked increase in the clearances to the running fits required as indicated in Figure 1 by the first part of the curves. The change in the condition of the surfaces is illustrated in Figures 2, 3 and 4.

Once these polished bearing surfaces and running clearances are produced as a result of engine use, very little wear will occur for many thousands of miles thereafter, if proper lubrication is provided. It must, therefore, be true that if wear takes place to any appreciable extent, such wear is directly due to poor lubricating value of the oil used or in rare instances, to poor design or materials.

When wear has progressed to such an extent that the piston rings possess perceptible up and down movement, the pounding action of the rings on the sides of their grooves tends to increase the enlargement at a very rapid rate. This is the point at which trouble from oil pumping usually commences and the condition existing is represented in Figure 5. Under this condition the clearances have become so large that no oil, regardless of body or character, will prevent oil pumping or overcome blow-by.

To summarize the progress of wear we have, first, the running-in period during which wear is slight but rapid ; next, the period in which the rate of wear is very gradual and dependent upon the degree to which the engine is correctly and efficiently lubricated ; finally, the continued and accumulating wear causes pounding of the rings in their grooves and oil consumption rapidly increases. Excessive wear should be cut short and corrected mechanically by repairs or replacements of the worn parts.

Fallacious Assumption—No. 3

That piston clearances and piston ring fits alone determine the choice of the proper oil.

While it is absolutely necessary that the correct oil be one of ample body and proper character to seal the piston rings against gas leakage under all operating conditions, there are three other equally important factors which must be considered in selecting the correct oil for any automotive engine.

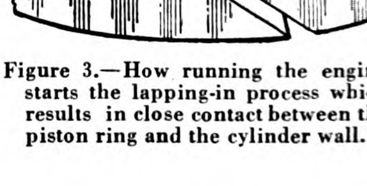


Figure 3.—How running the engine starts the lapping-in process which results in close contact between the piston ring and the cylinder wall.

The first is the operating temperature. This is influenced by the type of service, the type of cooling system employed, the cylinder dimensions, valve arrangement and by the details of design.

Second is the ability of the lubricating system to handle oils of different bodies.

It is well known that certain types of systems will lend themselves better to the distribution of light-bodied oils, while others work best with oils of medium or heavy body. It is also true that in some cases, due to details of the lubricating system, the employment of heavy-bodied oils may prove disastrous, due to lack of distribution of the oil under some operating conditions.

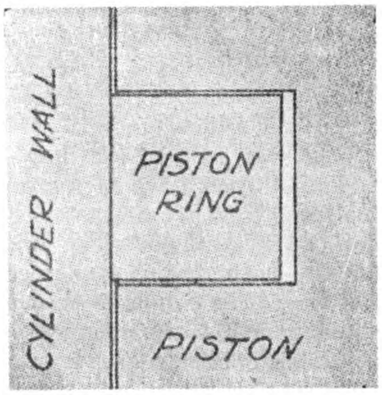


Figure 4.—Illustrating the smoothness of the friction surfaces in the fully run-in engine.

The third factor is carbon deposit. Due to characteristics of design, some engines will not burn cleanly oils of heavy body. The result is excessive carbon deposit which does not form when lighter oils are used. This condition is aggravated when heavier oils are used to overcome wear.

In other words, there are three very important factors which, in addition to piston and piston ring clearances, affect the selection of the correct oil and which may render inadvisable the use of oils of heavy body.

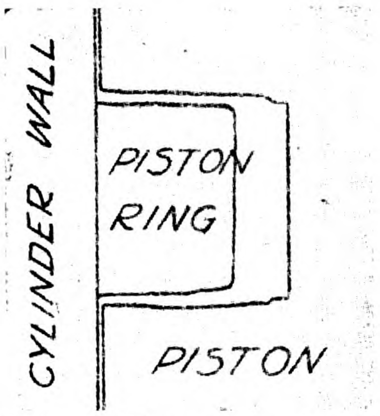


Figure 5.—When ring pounding sets in piston ring slot clearances enlarge to such an extent that no oil will seat the piston rings.

Fallacious Assumption—No. 4

That the use of a heavy-bodied oil in engines that have worn excessively will overcome oil pumping.

Oil pumping is the term usually applied when an engine is using large quantities of oil. In many cases it results in spark plug fouling and almost invariably in carbon deposits.

When oil pumping occurs in cars which have previously worked satisfactorily, heavier-bodied oils are often employed to reduce it.

It is a fact that heavier-bodied oils are usually consumed more slowly than light bodied oils but this remains true regardless of the condition of wear. Hence, if a change is made to a heavier oil in a worn engine this oil will also be consumed in proportionately excessive amounts.

Consequently, when such oils work into the combustion chambers in excessive amounts they are not completely burned but remain to form large quantities of carbon.

Therefore, if the engine design were such that a heavy-bodied oil could not be used when the engine was in good condition, due to excessive carbon deposit, this oil would be still more unsatisfactory when wear permitted it to pass the pistons in excess.

Any other factors of design making unsuitable the use of a heavy oil in a new car would continue to exist regardless of wear and render its use inadvisable.

We find that the determination of suitable lubricants for automobile or motor truck engines on an arbitrary mileage basis is unsound because:

1. *Rate of wear is not constant for all engines.* It varies with the design, material, manufacturing finish and the care given them in service. It is chiefly controlled by the value of the lubricants used.

2. *Wear is not measurable in terms of mileage operation.* The manufacturing finish is an initial variation especially in quantity production and all cars are subjected to a wide difference in care on the part of operators. The selection of the correct oil will minimize wear not affected by mechanical imperfection in design, manufacture and operation.

3. *Variation in piston clearance and piston ring fits are not the only determining factors in the choice of proper oils.* Operating temperatures, oil distribution, and the character of the oil as affecting carbon formation, are of equal importance.

4. *No oil, regardless of body, can seal excessively worn piston rings against oil pumping.* The recommendation of a heavier grade of oil after a short period of engine service is an admission that the oil originally recommended was incorrect.

Summary

The correct oil is the one which meets the conditions of operating temperatures and oil distribution; which provides a proper piston ring seal and in service leaves a minimum of carbon deposit. By its use, wear is greatly minimized. Such an oil will be of a character to provide efficient lubrication, under all operation conditions, throughout the life of the car. When accumulated wear becomes excessive proper repairs alone will overcome its effects.

Motor Vehicles in China

Recent statistics show motor cars to the value of over three and a half million Haikwan taels were imported into China in 1920, as compared with 1,272,981 and 2,158,998 Haikwan taels for the years 1918 and 1919 respectively.

The bulk of these cars came from America, but British cars are being seen in increasing numbers in the streets of Shanghai and other large towns. Unfortunately the cheapest British cars that come to China are far more costly than American cars of similar model and power, and unless some drastic reduction in the price of British cars can be effected it is impossible for them to hope to be able to compete successfully in Chinese markets. It should further be borne in mind that as yet there are few really good roads in China, cars being used principally for town work, and there is no doubt that for crowded traffic and narrow streets with sharp turnings the low-geared American car is far more suitable than the high-geared British car.

It is satisfactory, however, to note the British motor car manufactures have begun to realize the possibilities of the China market and that several leading manufacturers have recently concluded agency agreements with local garages. Motor trucks and lorries are coming into general use for transport purposes, and there would appear to be a great future for this class of vehicle in China.

New American Steam-Driven Motor Cycle

From time to time, experimental steam-driven motor cycles have made their appearance, and so the use of steam as a method of propulsion is by no means new. It is interesting to note therefore that an American, named Longford, has produced a "gearless, beltless, chainless and noiseless steam-driven motor cycle," which is expected to sell at a lower price than that of the average petrol-driven machine.

The machine runs on kerosene, which generates the steam, and a consumption of 45 m.p.g. of kerosene and 55 m.p.g. of water is said to have been obtained. The boiler of the machine is of the semi-flush type. There are two $2\frac{1}{2}$-in. by 3-in. cylinders attached one on each side of the rear wheel, giving a direct pull without any loss of power. The engine is capable of developing 300 r.p.m., and 2,000-lb. pressure can be applied to the rear axle crankpin by opening the throttle to its fullest extent.

Good Roads in China Affect all Countries

THERE is to-day not a nation in the world with any commercial or industrial development worthy the name, that is not vitally interested in China. This is because of the 400,000,000 Chinese people, who form a potential market of tremendous purchasing power for all manner of goods.

Practically the only market in China of immediate value to the foreign exporter is in the large coast cities, Peking, Hongkong, Shanghai, Canton, etc. The development of the interior has been retarded by the lack of means of transportation and communication. Without good roads, permitting commercial intercourse between the coast and the interior, the century-old ideas and idiosyncrasies of the Chinese cannot be overcome.

Good roads are therefore a fundamental and primary requisite for the economic development of China. This has been poignantly brought to the attention of the civilized world during the famine of the last year. In many instances food rotted at railway terminals, while at a distance of 50 to 100 miles hundreds and even thousands of people starved, because there were no means of transporting the food to them, and no roads. The afflicted region, with a population of 45,000,000, is impenetrable to all except the most primitive forms of cart and wheel-barrow transportation.

The American Red Cross is engaged in the construction of roads to make use of the famine labor in the stricken territory. One of these roads, in the province of Shantung, will be nearly 100 miles in length. At present the total mileage of metalled roads in China does not exceed that figure.

Natural conditions in China are favorable to the building of roads. There are no torrential rains to wash away the subgrade and undermine foundations; and there are no long periods of frost except in the extreme north. Furthermore, the materials necessary for road building are available in the country itself.

There are two chief obstacles in the way of road building in China—national poverty, partly real, partly due to corrupt officials; and that individualistic trait in the Chinese character, strengthened by the keen competition for existence, which prevents co-operative effort to further movements for the common welfare.

There is, however, encouragement in the fact that the past two years have witnessed the beginnings of what will some day be a national movement for good roads. The first important road in China was built by the American Red Cross several years ago, from Peking to Tungchow, to relieve the victims of a flood in North China. As a direct result of this work sporadic road building projects have sprung up, notably in the Tientsin and Shanghai districts. Other projects of a similar nature are in contemplation.

The merchants are the most progressive element in China and the hope of good roads lies largely in their hands. Fortunately, they are beginning to display considerable interest in the matter, and this interest must be encouraged by foreign manufacturers, especially manufacturers of motor cars and trucks.

Public opinion is perhaps a more potent force in China than in any country in the world. For that reason, the education of public opinion to the value of good highways is essential. The greater the number of Chinese who own motor cars and trucks, the greater will be the demand for roads.

Nothing can be expected at the present time from the Chinese government at Peking, on account of the instability and poverty of that organization. The suggestion that foreign manufacturers, especially motor car manufacturers, make loans to the Chinese government for the purpose of road building is not feasible for the reason that the control of the central government over the various provinces is not well enough defined, and the result would probably be a waste of the funds thus made available.

Under the consortium of foreign powers great progress in the building of national highways should be made. Herein lies the greatest immediate hope of such projects. Public opinion, built up and made active through the extensive use of motor vehicles, should insure the continuation of road building by the Chinese government, once the latter is firmly established.

FURTHER BIG REDUCTIONS

DENNIS

COMMERCIAL MOTORS

Practically back to Pre-War Prices

Type	To-day's Price	Price Jan., 1921	Reduction
2-2½-ton Standard Lorry Chassis...	**£730**	£ 997	*£267*
2-2½-ton Long Char-a-bane Chassis	**£750**	£1,007	*£257*
3½-4-ton Lorry Chassis	**£865**	£1,195	*£330*
3½-4-ton Char-a-bane Chassis ...	**£880**	£1,190	*£310*
4-ton Long Wheelbase Omnibus Chassis	**£950**	£1,200	*£350*
5-6-ton Lorry Chassis	**£960**	£1,320	*£370*

The prices given above are F.O.B. Guildford, England

WITH a view to stimulating trade and maintaining employment, we have written down our Stocks to a figure very much under cost, and this, with the wages reductions that will take place in the near future, has enabled us to sell our Chassis as from October 1st at the prices mentioned opposite.

Purchasers of "DENNIS" vehicles, even at such low prices, can feel perfectly assured that they are acquiring absolutely new goods of latest and most improved construction, as Dennis Brothers have never purchased or taken back second-hand War Lorries. The Vehicles we are offering are absolutely new and embody improvements on previous models. We have been able to keep our factory busy on new productions, and are not selling Chassis made two to six years ago and re-purchased from the Government, nor are we offering re-conditioned War Chassis.

WRITE FOR PARTICULARS:—

Agents:

Messrs. Wearne Brothers, Ltd., 310 Orchard Road, Singapore.
Messrs. Perrin Cooper & Co., Consular Road, Tientsin.
Messrs. Central Garage Co., 9 Hongkong Road, Shanghai.
Messrs. Alex Ross & Co., Ltd., Machinery Department, Hongkong.
Messrs. Fikkert Motor Car Co., Weltevreden, Batavia.

Cables: A.B.C. 5th Edition, Lieber's, Bentley's, Marconi.

DENNIS BROS., LTD.

GUILDFORD, ENGLAND

D 221

The Gleniffer

MESSRS. Gleniffer Motors, Ltd., manufacture four-stroke marine motors of the paraffin type though they also build them to run on petrol only if desired. The engines which they are at present manufacturing have all been designed within the past two years. The aim of the designer has been to produce an engine which will be as far as possible fool-proof and require as little attention—and especially skilled attention—as possible. At the same time it should be able to run for extended periods without the necessity of an overhaul.

Two series of engines have been designed, one series having cylinders 4½-in. bore by 5-in. stroke and made in two, four and six-cylinder models, and the other series having cylinders 6-in. bore by 8-in stroke, made in one, two, four and six-cylinder models. The 4½-in. by 5-in. paraffin engines develop 12, 24 and 36 B.H.P. and the petrol engines 14, 28 and 42 B.H.P. The 6-in. by 8-in. engines develop 12½, 25, 50 and 75 B.H.P. on paraffin and 15, 30, 60 and 90 B.H.P. on petrol. The normal speed of the 4½-in. by 5-in. series is 800-1,000 R.P.M. and of the 6-in. by 8-in. series 600-700 R.P.M.

All corresponding parts in the different models of each series and made interchangeable, even such parts as the reverse gears, governors and water pumps (the strokes of which are altered by fitting different eccentries) are the same in all engines of the same series, and all the main bearings are alike and interchangeable with the big end bearings. By this means quantity production of all the smaller parts can be attained at the same time as offering a fairly large selection of models and thus also can the cost of production be lowered.

The line drawing shows the details of construction of the 24/28 H.P. four cylinder 4½-in. by 5-in. engine and reverse gear, which shows the general design of the complete range of engines manufactured by the firm.

The cylinders except, of course, in the single-cylinder model, are cast in pairs, having detachable heads and inclined valves operated by rocking lever tappets with rollers running on the cams.

The compression joint on the head is made by a copper and asbestos gasket and the water joint by rubber rings. These rubber rings prevent the water coming in contact with the asbestos or copper of the gasket which thus overcomes the chief difficulties connected with detachable heads. It also facilitates the detaching of the head, which is done by merely disconnecting one outlet water connection and the holding down nuts. Inspection and cleaning doors are fitted on each end of the water jacket. The detachable cylinder head is so arranged that the piston and connecting rod may be removed for inspection through the top of the cylinder without moving the cylinder itself. The gudgeon pins are located in the pistons by a contracting spring steel ring in a groove round the piston. The connecting rods are of conventional design. The big-end bearings are die cast white metal bushes housed in steel keeps and are interchangeable with the main bearings which latter are mounted on the bottom half crank case.

The reverse gear is incorporated in the fly-wheel at the after end of the engine and is entirely encased within the crank case, with the result that the outfit takes up very little space fore and aft, and gives a particularly clean appearance. A unique system of lubrication is employed, the oil being thrown by the fly-wheel from tle sump into an oil-collecting chamber in which are placed small buckets which catch the oil; from there it is led by gravity through large bore copper pipes to cups above each main bearing. The overflow from these cups supplies the troughs in the bottom of the crank case from where it is splashed by dippers on the big ends to all the remaining working surfaces of the engine. The reverse gear, being in the after end of the crank case, is, of course, running in oil. This lubrication system is thus entirely automatic and fool-proof. In the larger sizes of engines the lower portion of the base chamber is water jacketted for its entire length thus keeping the lubricating oil at a moderate temperature.

In order to reduce the work entailed in running the engine and to reduce the chances of ill-usage all moving parts in the engine, with the exception of the water pump eccentric, are enclosed within the main crank case and are lubricated from the splash caused by the connecting rod dippers. The oil which works out along the pump driving spindle is fed into the eccentric, thus rendering the automatic lubrication complete.

It might be thought that a totally enclosed engine would be very inaccessible, but this is not the case in these engines. Exceptionally large doors are fitted on each side of the crank case which are amply large enough to enable spanners to be manipulated with ease, and also to examine, adjust or replace main or big end bearings. Large doors secured by finger-screws are likewise fitted to the chambers in which the valve spindles and rocking levers operate. From these chambers is drawn a proportion of the air which supplies the vaporizer. This maintains the circulation of oily air into these chambers and at the same time prevents all leakage of foul air from the crank case into the engine room.

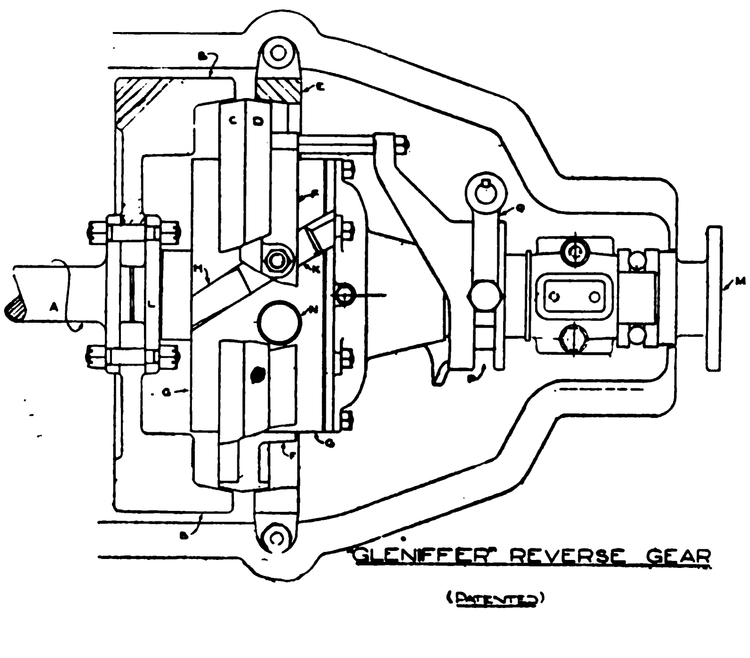
The paraffin vaporizer is of the exhaust heated type and is ingeniously arranged to make use of a physical property of the fuel which completely overcomes the difficulty of vaporization when running for prolonged periods at dead-slow speed.

The temperature at which paraffin can be completely vaporized is dependent to a considerable extent on the pressure at which the vaporization takes place. The lower the pressure is, the lower will be the temperature necessary to cause vaporization.

In a throttle-controlled engine running on no load or dead slow a partial vacuum is formed between the throttle and the cylinder. This reduction of pressure amounts to as much as 7 to 8-lb. per square inch when an engine is "ticking over" or in other words the pressure in the inlet pipe is about one-half the atmospheric pressure.

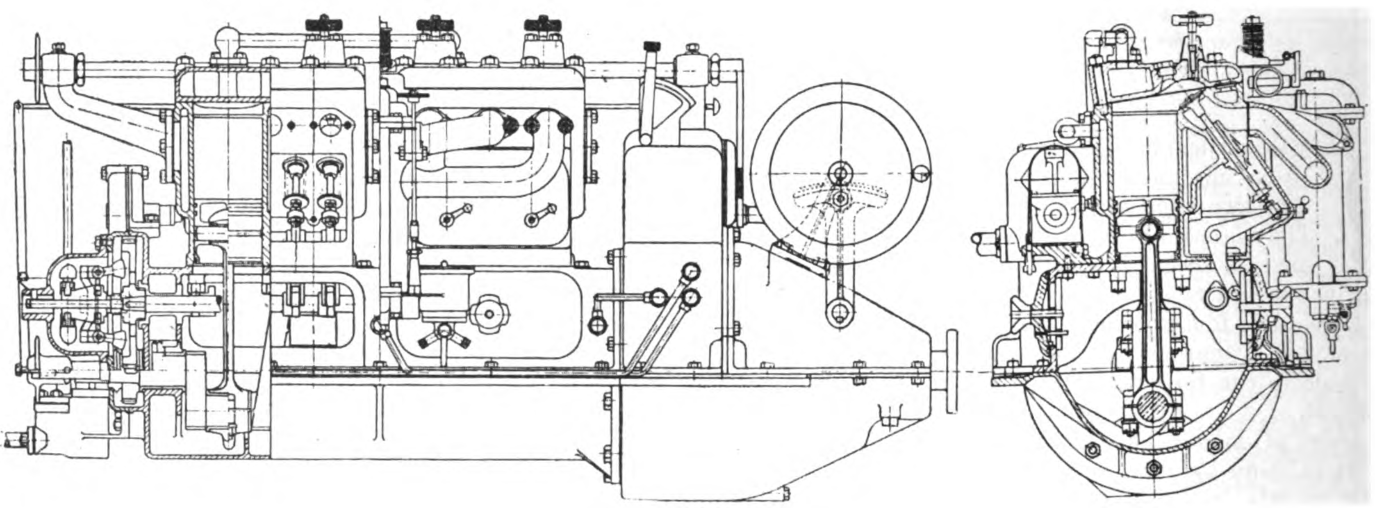
In order to take advantage of these properties of the fuel the throttle is so arranged in this vaporizer that the fuel is subjected to the above-mentioned partial vacuum throughout the period of its carburation and vaporization.

The arrangement of the parts of the vaporizer are as shown in the diagrammatic line drawing in which C is the throttle which controls the whole supply of air entering the system. Part of the air passes down the passage L where it is heated by contact with the wall of the exhaust heated chamber. It then passes up through the choke tube F drawing with it a supply of fuel from the jet G, and continues through the exhaust heated tube M, and so to the engine. An



"GLENIFFER" REVERSE GEAR

(PATENTED)



automatic air valve D is fitted which is controlled by the spring A to which a tensioning device is fitted (not shown in the diagram). A dash pot B is also fitted to prevent violent movements of the valve. The valve H is used to control the flow of fuel from the float chamber through the passage K to the jet G. It is essential that the pressure on the fuel in the float chamber should be the same as the air before passing through the choke tube. For this reason the passage E is necessary.

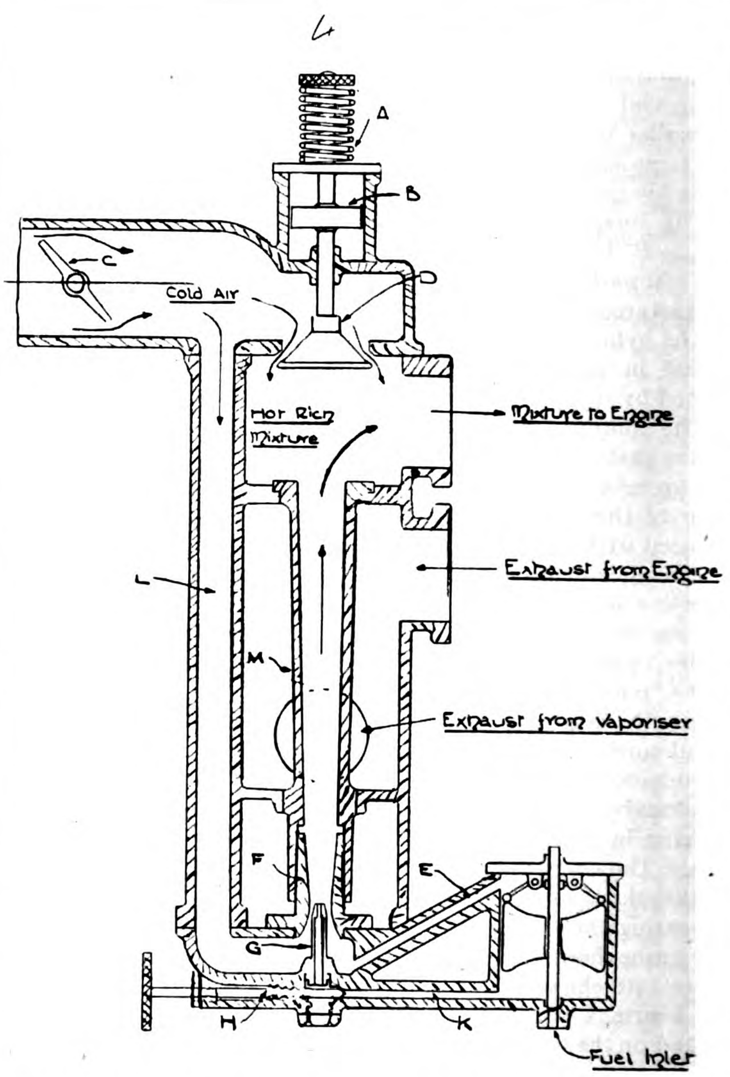
When the engine is running on full load only a small proportion of air passes down the passage L which forms an excessively rich mixture at the choke tube. This rich mixture is heated to a high temperature in the tube M which completely vaporizes the fuel. The mixture is then diluted to the correct strength by pure cold air from the valve D and passes to the engine at a moderate temperature. When running dead slow the valve D is closed automatically and all the air passes the choke tube where it draws only sufficient fuel from the jet to make a correct mixture, this passes through the heating chamber M which is now at a much lower temperature than when running at full load, but owing to the partial vacuum in the system complete vaporization still takes place.

The vaporizer is initially heated by running the engine for 3 minutes, on petrol after which it will run on paraffin, or it may be initially heated by a blow-lamp. When the engine is hot it will start on paraffin without the use of petrol. This may be done as late as 1½ hours after stopping. A centrifugal governor acts directly on the throttle and the speed at which it governs is controlled by a hand lever.

The Gleniffer patented reverse gear depends for its action on a principle which is a completely new departure for this class of mechanism.

The working of the gear may be followed by reference to the line drawing, in which A is the after end of the crankshaft, B is an extension of the fly-wheel rim, the inner surface of which forms the ahead driving clutch, and C is the corresponding driven member. E is a stationary clutch member which engages with D. C and D form one part with the sleeve F which is a sliding fit on the drum G and is constrained to move along this drum in a helix by means of the keyway H and the key K, this key being secured to the sleeve F. Within the drum G is contained an ordinary bevel epicyclic train of wheels. The driving wheel is keyed to shaft L and the driven wheel to shaft M. These are two intermediate pinions supported on pine N secured to the drum. The gear is operated by the lever Q acting through the collar P by means of which the clutch sleeve C D F may be moved into engagement with either B or E. The gear as shown is arranged for an engine, the shaft of which revolves as shown by the arrow on the shaft A.

When the clutch member C is brought into engagement with member B the member B tends to drive it in the same direction as the arrow, this in turn forces the key K against one side of keyway H and causes a longitudinal thrust which thrusts the clutches firmer together. This thrust is proportional to the torque transmitted and maintains the clutch members C and B in contact with sufficient force to transmit the power of the engine. As soon as a force is applied pulling the clutches apart, by means of the operating gear, the force of contact between the clutch members is reduced and allows slipping to take place and the clutch offers no further



"GLENIFFER" VAPORISER

(PATENTED)

resistance to disengagement. When the clutch members C and D are in mid position, *i.e.*, in neutral the driven shaft M is stationary. At the same time the drum G is idling round. To obtain the reverse motion the clutch member D is engaged with the stationary member E. A longitudinal thrust is now produced by the keys in the helical keyways which maintains these two clutches in engagement in an exactly similar manner to the ahead clutches. By this means the drum G is brought to a standstill and the action of the bevels is to give an astern motion to the shaft M, which revolves at the same speed as the engine.

It will now be seen that the operating gear is only necessary to engage or disengage the ahead or astern clutches. As soon as either of them is engaged the torque of the engine holds it in engagement. It will also be observed that any wear which takes place on the clutch surfaces will not affect the working of the gear, which requires no adjustment whatsoever. The operation of the gear is very simple and sweet in action. This gear is entirely independent of propeller thrust for engagement of the clutches thus eliminating the difficulties experienced in gears of that type in which the thrust varies inversely with the boat speed for a given power of engine. It also eliminates the inavoidable force and aft movement of the propeller shaft that is inherent to that type of gear.

Singapore Exhibition Diploma Award to Gleniffer Motors

One of the features of the marine side of the Malaya-Borneo exhibition held recently at Singapore was the exhibit of Messrs. Ritchie & Bisset who are sole agents for Malaya for Gleniffer Motors, Ltd., Anniesland, Glasgow. Their exhibit obtained first mention amongst the few diplomas awarded for imported marine machinery.

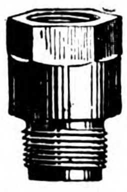
On show was one of the new model K2 engines fitted with glass crankcase and flywheel casing doors, and fixed on bearers having a rake of 1 in 7. Electric lights were fitted inside the crankcase. This engine was driven by an electric motor and belt and the most efficient lubrication by Gleniffer's patent system was shown in operation. Near at hand was one of the model L.10/12 H.P. engines, also one of the new M.4 24/28 H.P. engines complete with all the standard outfit. The latter engine should prove very popular with Far Eastern buyers. A demonstration reverse gear and a sectional vapouriser—both being Gleniffer's latest patents and fitted on all new models—were also on view, and, together with a selection of spare parts, made a very interesting show.

Also on exhibit was a 25-foot teak motor boat fitted with a model L.10/12 H.P. engine. The hull was built in Singapore by Chinese workmen and is a fine example of the local boatbuilder's art.

Increasing Spark Plug Efficiency

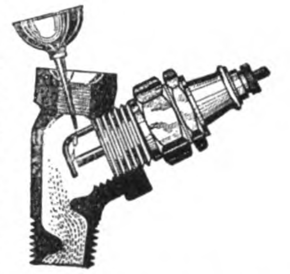
IGNITION trouble is one of the most common causes of annoyance to the motorist. Engineers are constantly endeavoring to invent means of eliminating all defects in motor construction that prevent a regular and efficient sparking. A device designed to accomplish this result, and being placed on the market by the Gemco Manufacturing Company, Wisconsin, is the Baf-Oil Plug.

½-inch Size Plug

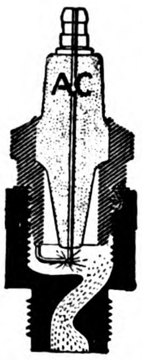


⅞-inch Size Plug

The plug consists principally of a combustion chamber into which the spark plug is screwed in the usual manner. There are two baffle plates in each chamber which prevent the oil from reaching the firing points. Each plug is a complete unit in itself and has no mechanical contrivance to wear or get out of order. The illustrations show clearly the operating principle of the device.



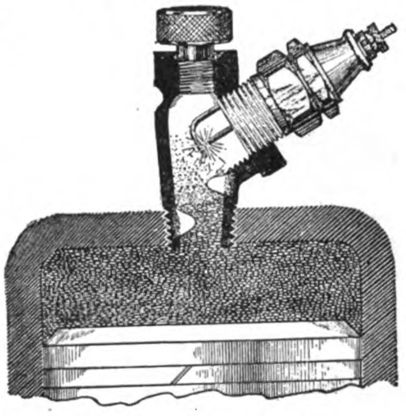
Showing Method of Priming



Cross Section of Plug

In addition to keeping the oil from reaching the firing points, the baffle plates, becoming extremely hot while the motor is in operation, act as hot spots which it is said completely vaporize the gasoline. When the spark occurs, the vaporized gasoline in the combustion chamber ignites and enters the cylinder proper, causing a clean explosion, increasing the power of the motor and reducing carbon deposit.

The Baf-Oil Plug is made in two sizes, ½-inch and ⅞-inch. A priming feature is included in the ½-inch size which is highly desirable, especially in cold weather.



Complete Installation of Baf-Oil Plug

Tokyo's Revised Automobile Tax Schedule

(These Rates Became Effective April 1st)

Classification:	1922 Prefectural Tax	1922 Regular City Tax	1922 City Planning Special Tax	1922 Total	1921 Prefectural Tax	1921 Regular City Tax	1921 City Planning Special Tax	1921 Total	Reduction as compared with Last Year
Personal Use.									
20 H.P. or more	Y.255.00	Y.469.20	Y. 63.75	Y.787.95	Y.300.00	Y.543.00	Y.120.00	Y.963.00	Y.175.05
15 H.P. or more	200.00	364.00	50.00	614.00	210.00	388.50	84.00	682.50	68.50
10 H.P. or more	131.00	241.04	32.75	404.79	131.00	247.59	52.40	430.99	26.20
5 H.P. or more	79.00	146.15	19.75	244.90	79.00	150.10	31.60	260.70	15.80
Less than 5 H.P.	44.00	84.04	11.00	139.04	46.00	89.24	18.40	153.64	14.60
Commercial Use.									
20 H.P. or more	Y.120.00	Y.220.00	Y. 30.00	Y.370.80	Y.150.00	Y.271.50	Y. 60.00	Y.481.50	Y.110.70
15 H.P. or more	86.00	156.52	21.50	264.02	107.00	197.95	42.80	347.75	83.73
10 H.P. or more	60.00	110.40	15.00	185.40	67.00	126.63	26.80	220.43	35.03
5 H.P. or more	40.00	74.00	10.00	124.00	41.00	77.90	16.40	135.30	11.30
Less than 5 H.P.	24.00	45.84	6.00	75.84	24.00	46.56	9.60	80.16	4.32

The above automobile tax rates are those which will be effective in Tokyo for the remainder of the present year, the old levies having been revised to take effect April 1. This chart shows in detail the new rating for each classification of car, both in its component parts and in total, as well as the old rates. The last column gives the amount of reduction which has been made for each class of machine.

General Motors Opens Largest Office Building in the World

THE new General Motors building in Detroit, Michigan, U.S.A., which has been in the process of construction for the past two years, is now practically completed. Already, half of the offices are occupied, and the entire building is the scene of ceaseless activity.

Fifteen stories in height, covering an entire city block, with a total floor space of 1,200,000 square feet, and containing approximately 2,500 offices, this single building, said to be the largest office structure in the world, will, when present plans have finally been carried out, house no less than 6,000 office workers—a number sufficient to support a population of 30,000.

The main floor, with its great show rooms, is intended for the display of General Motors products. Ultimately, it is going to be an all-year automobile show, and will be brilliantly illuminated every night of the week. At the present time, Buick, Chevrolet and Oakland cars are displayed there, and within a short time all the other important units of the General Motors lines will be quartered in the same building.

On the ground floor, there is a large auditorium, seating 1,500 persons, and equipped with a stage and other complete appointments. This will be available for meetings and assembly purposes of all kinds.

The second and third floors are devoted to general office use, and already representatives of the spare parts and accessory manufacturers serving the automobile and allied trades are filling up the offices to such an extent that the building promises to be a real headquarters for this particular division of the motor industry. Twelve floors will be reserved for office space for the General Motors Corporation, and its affiliated companies. The building will also contain a bank, railroad ticket offices, and telephone and telegraph stations.

Adjoining the main building are the engineering laboratories, devoted to part of the important research activities of the General Motors Corporation. These are in one building 500-ft. long and 60-ft. wide, and equipped with the most highly developed apparatus for testing manufactured units in all stages of production. An independent power house with a reserve capacity sufficient to meet all possible demands is connected with the main building by a tunnel 368-ft. in length.

The General Motors building is located at the geographical centre of Detroit, near the intersection of two main arteries of street traffic. Already, its opening has stimulated the growth of business in its vicinity. Anticipating the future growth of Detroit in this direction, this new building has been built to endure for 100 years or more.

French Road Builders Announce New Methods

The French, ever to the fore in matters of highway development, have just announced a new type of highway, which gives promise of solving some of the difficult problems of those who build roads. The surface of the road is composed of a new material compounded of concrete, iron and cement. The first completed section of this type of construction was recently inspected by French, British, Belgian and American highway engineers and the chorus of unqualified praise augurs well for the future.

In construction a great trench is first constructed and in this a layer of concrete is placed, approximately five inches thick. On top of this is placed another layer of pure cement of the same thiskness. In the cement are placed large iron studs, 25 to the square yard. This mass is then covered with a layer of fine concrete, which is laid on before the cement below is quite dry. The whole is then thoroughly cured by the water process and the result is claimed to be the best road seen in Europe since the highway builders of the Roman empire threw up their job.

A New Air-Cooled Motor Cycle Engine

THE design of engines for motor cycles presents many problems of interest to the engineer and of great importance to the manufacturer. Simplicity, robustness, reliability, smoothness of running, efficiency, and many other qualities have to be combined in a machine which must in the end be cheap. Mainly because of this last factor, many refinements employed in the motor car engine cannot be adopted in the motor cycle engine. Such conditions offer a clear stimulus to the skilful designer, and a new type of engine produced by a British firm marks a considerable advance towards the ideal. It is an air-cooled motor-cycle engine with sleeve valves. Hitherto the use of the sleeve valve in any type of motor car engine has been looked at a little askance, owing to expected trouble with lubrication and cooling. These troubles are not encountered in the numerous examples of automobiles fitted with sleeve-valve engines; and their success has led this firm to adopt the sleeve valve in an air-cooled engine—the first time this combination has ever been attempted. One great advantage of the sleeve valve is its silent action, the public will be grateful for any reduction in the noise made by motor cycles. The new engine has a single cylinder and gives a nominal output of 3 horse-power, but it can give a much higher power than this over-long periods. As much as 7 horse-power is produced at 7,000 revolutions per minute. Its total weight is only 50-lbs. The number of parts in the engine is much less than in the ordinary type, and every detail is first-class in material and workmanship.

To aid the motorist to give intelligent care to his tires, the technical service department of the United States Tire Company has prepared a number of folders of specific technical information. Folders issued to date are entitled "Nomenclature," "Flaps" and "The Use of 31 by 4 Tubes in 30 by 3½ Clincher Cord Casings." Other folders will be published as the need arises.

GLENIFFER
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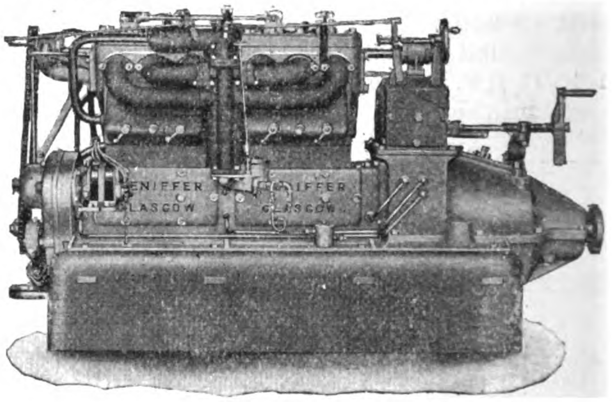
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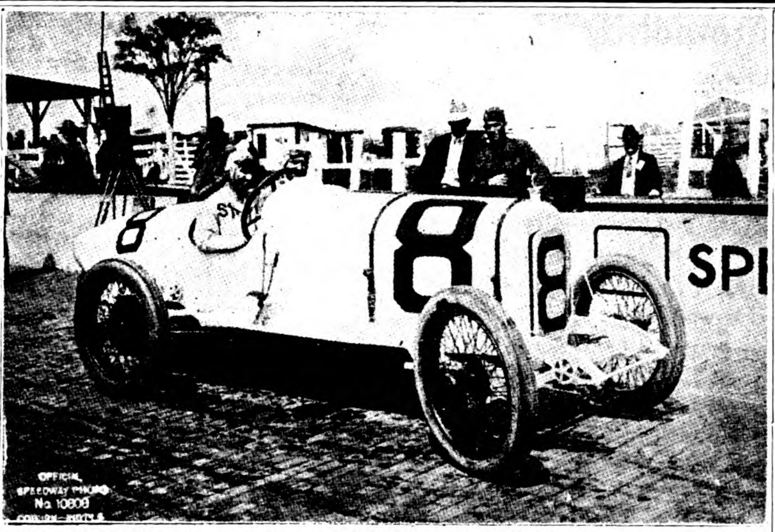
Graphite Transmission and Differential Grease No. 677

We are proud to state that No. 677 has justified the labor and expense devoted to a really intelligent effort to produce an ideal gear lubricant. It has successfully stood the test of years. There is nothing like it on the market. It is the grease the "Speed Kings" use.

No. 677 is graphited grease of medium density that flows over the gears like an oil, yet possesses the peculiar property of not settling when the gears are not in motion. It reaches all the bearings and provides a graphite coating that prevents wear, reduces friction and causes cool running at all times. No. 677 remains unchanged in hot or cold weather. It will last far longer than the best plain grease.

No. 677 is recommended for transmissions and differentials, except those designed for light oil lubrication. The consistency is about that of heavy gear oil. It is also the most satisfactory lubricant for electric gear shift mechanisms, the reverse gears of power boats, and for change-speed gear boxes of motorcycles.

Sold in one, five and ten pound tins. Larger packages if desired.



"Dixon's Graphite Automobile Lubricants are about as necessary to a racing car as gasoline. I like their kind of lubrication for my cars."—EARL COOPER

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SHANGHAI, CHINA

Graphite Cup Greases

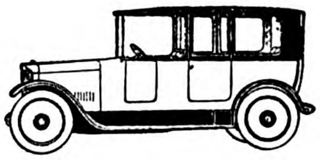
Cup Greases containing fine flake graphite reduce friction to a minimum. By using these high-grade graphited greases, bearings soon acquire the well-known graphite polish that eliminates friction and causes easy running. Use in all grease cups, wheel spindles, etc.

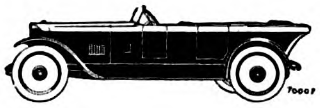
Dixon's Graphite Cup Grease No. 3 is recommended, except in warm climates, where No. 5 is more suitable. The consistency of each grade changes but little under wide temperature variation.

The importance of attending to the numerous small bearings and moving parts of cars is frequently overlooked. Wherever you see a grease cup don't think it is put on as an ornament, but give it a turn once a day or once a week according to the requirements. Don't forget to keep the cups filled with grease.

Sold in one, five and ten pound tins. Larger packages if desired.

BENZ





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Manila's New Automobile Tax

THE following are the principal provisions of the new Manila automobile tax law which went into effect recently :—

Exemption from license is granted to automobiles and trucks belonging to the United States, insular, provincial and municipal governments ; those not regularly kept and used in the city of Manila, and those for personal use of the consular representatives of foreign nations.

On each passenger vehicle an annual tax shall be paid as follows : Twenty-five centavos for each horse power, one centavo more per kilogram, gross weight, for each vehicle equipped with solid or pneumatic tires, and two centavos additional for each kilogram of gross weight of the vehicle and load when equipped with metal tires. All vehicles for rent in the streets or plazas or in garages and other places for public hire, also all cars registered by the bureau of public works in classes "H," "G" or "P.U." shall pay double the above taxes.

Gross weight for a passenger vehicle means its actual total weight, loaded, calculating 70 kilos for each passenger.

All motor trucks, whether used for cargo or passengers, shall pay a tax of P.40 for the first ton capacity and one centavo for each additional kilogram capacity.

Trailers of less than two metric tons capacity must each pay P.10 annually and those of larger capacity P.20 annually.

Motor cycles without side cars are taxed P.3 a year, and those with side cars P.5.

If original application for license comes between January 1 and March 30, the full year's tax shall be paid ; if application is made in the second quarter, only three-fourths of the annual tax shall be paid ; if in the third quarter, one-half of the tax is assessed ; and during the last quarter, only one-fourth of the annual tax will be required.

All the money collected from this tax goes to the fund for the construction and repair of the streets of Manila.

Fines for violation range from P.25 to P200, inclusive.

Siam's Motor Imports

According to the department of overseas trade report on the commercial situation in Siam, motor cars (six) at a value of ticals 35,090 (£3,110) were imported from the United Kingdom and ninety-five valued at ticals 377,787 (£33,491) from the United States.

Motor car parts to the value of ticals 116,434 (£10,322) were imported from the United States. From these figures it will be gathered that there is room for more business in the line in his majesty the king of Siam's dominions.

Motor Trucks in Japan

Although the Japanese government encourages local manufacture of motor trucks by granting a bounty for cars built according to military specifications, output does not meet demands. United States exporters are busy in Tokyo and Osaka, where exists the most promising outlet for such vehicles. Widened roads and strengthened bridges are expected to create a demand in the smaller cities and country districts.

Entrusted with a mission of propaganda through the United States of America, General Diaz, head of the Italian army, met with an enthusiastic reception wherever he passed. The object of the mission was to bring home to the American people the efforts of the Italian nation towards the securing of victory in the great war, and the desire of this people to help forward universal peace.

Naturally the motor car played its part in the demonstrations of the American people, for whereas in the Old World an official procession is made up of carriages drawn by prancing horses, in the United States the motor car only is used to carry distinguished visitors through the city streets. Picturesqueness was added to these scenes by the presence of Italian soldiers in full uniform, with mounted American police acting as a guard of honour.

Humber

Cars of Comfort and Refinement

THERE is a general consensus of opinion among motor experts and owner drivers that a Humber Car is typical of all that is best in motor car design and construction. Indeed we have contrived to put into every model an engine with wonderful flexibility and acceleration, a thoroughly sound well-balanced chassis, and a body the comfort and refinement of which contribute in no small measure to the Humber reputation.

Full Particulars Sent on Request.

HUMBER LIMITED

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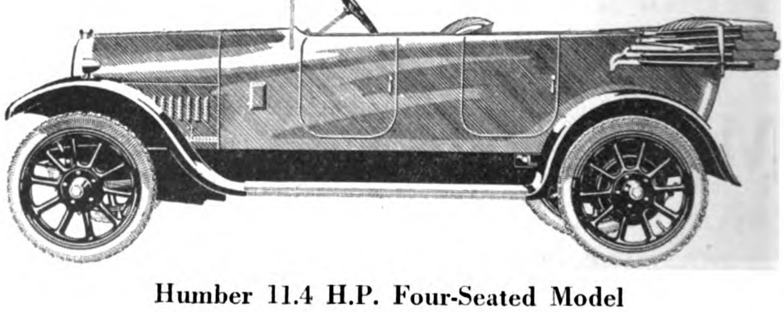
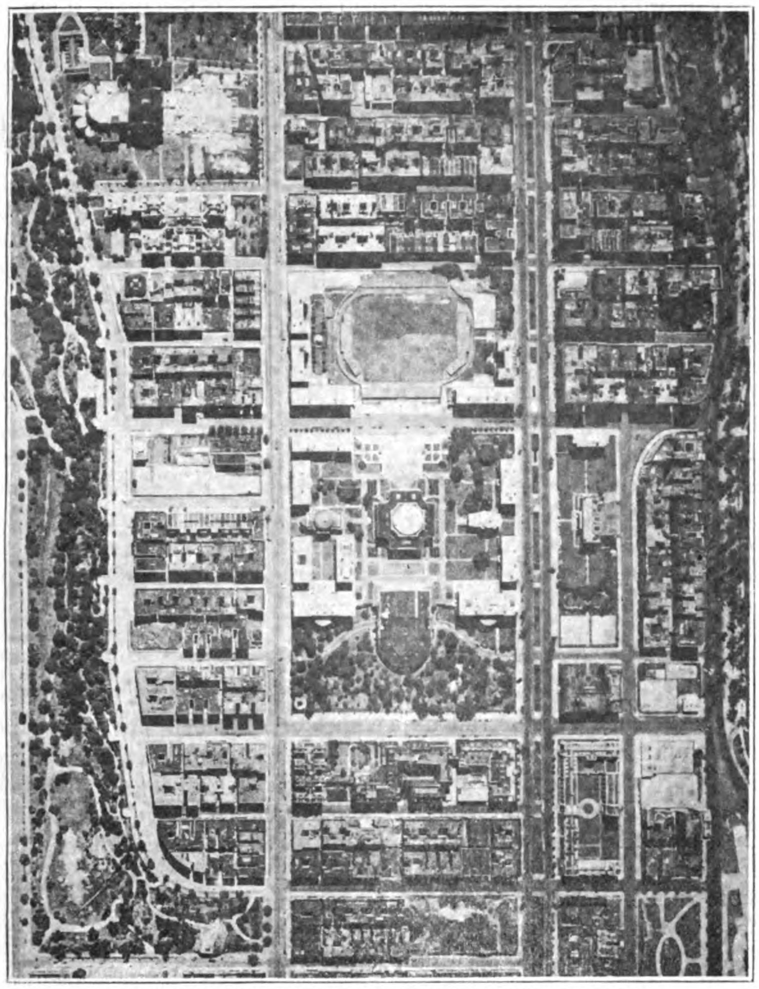
COVENTRY, ENGLAND



Humber 11.4 H.P. Four-Seated Model

Aerial Photography



A SECTION OF THE NEW YORK MOSAIC MAP

It is the Morning-side heights district. The white circle in the centre is the dome of the Columbia University Library. Just below may be seen the south field. In the lower right-hand corner may be seen the St. John's Divine. Note the seven chapels at the right and at the left the foundation of the uncompleted Cathedral. Along the right side of the picture may be seen the Morning-side Park and in the extreme upper corner Grant's Tomb. This view is one of the one-hundred vertical photographs that go to make a complete Mosaic of Manhattan Island. The view is a permanent record made by one flash of the shutter.

AMERICA has added another important invention to her rapidly increasing number of distinctive achievements in aviation.

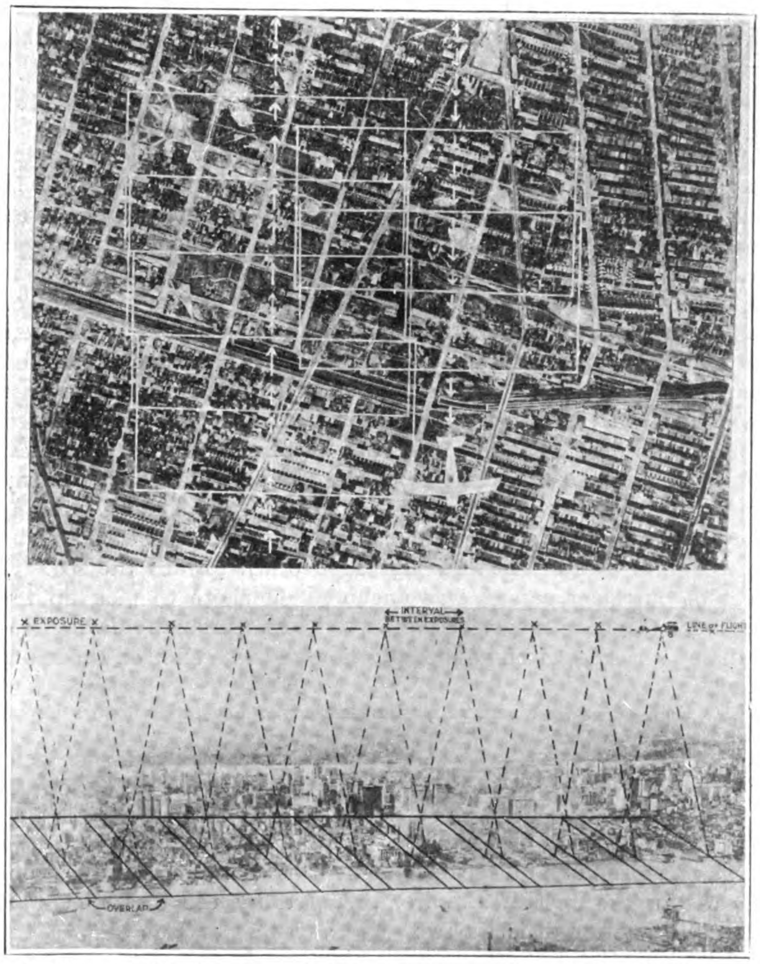
It is the perfected aerial camera which has just given a remarkable demonstration of efficiency in a photograph of New York city from the air. Municipal engineers say it will save many thousands of dollars and years of engineering work in effecting public improvements. The photograph is more than 8-ft. long and 20-in. wide. It shows more than 32 square miles of the metropolis, every street, building, vehicle and person out of doors, just as one would see it looking down straight upon it from a position high overhead.

The machine which made the photograph possible is a big camera with several new devices invented by Sherman M. Fairchild, president of the Fairchild Aerial Camera Corporation, 136 West Fifty-second Street, New York. His experiments the last three years have been directed toward making the camera accurate and economical, the main essentials in practical commercial photography, particularly aerial maps such as that of New York.

Inaccuracy has been the chief difficulty with various kinds of apparatus employed heretofore. Many technical problems were overcome by the Fairchild inventions which so improved the mechanism and actual work of this new camera that the results were better than 99 per cent. accurate—more than sufficient for all practical purposes, according to municipal officials and engineers and those of large corporations who see in this development limitless possibilities for saving time and money in many branches of their work.

The New York photograph is a vertical one; that is, it was taken from an airplane flying directly overhead, and is known technically as a mosaic; or aerial map. Using a film similar to the ordinary camera, though larger, and regulating its exposure by means of an electric timing device gauged to the relative speed of the airplane from which the camera was operated, Fairchild succeeded in removing the hundred and one difficulties which have delayed commercial progress in this kind of mapping.

Plotting the city into rectangular sections of a scale so that each section could be photographed individually from the plane right over its exact centre, the entire city from the Battery to Van Cortlandt Park was divided into 100 parts. Each of them was photographed. The hundred photographs were taken in a single flight of 69 minutes. As the plane passed over the centre of each rectangular section there was an automatic click of the camera, and the film automatically rolled into position for another exposure a few seconds later. When the sections had all been "snapped," Fairchild had 100 photographs, all together totaling an area of approximately 32 square miles. They were then fitted together like a picture puzzle and mounted on cardboard—and there lay New York, with everything out of doors plainly visible and accurate in size and location.



A diagram showing how thrty-two square miles of New York was plotted and photographed in sixty-nine minutes with a modern aerial mapping camera. Above is a plan of the area. Below is a cross-section diagram showing the method of procedure.

Effect of Tropical Climates on Airplanes

IN a lecture before the Royal Aeronautical Society (England) Air-Commodore H. R. M. Brooke-Popham, vice chairman of the society, gave an interesting description of the new desert route between Cairo and Baghdad. He also dealt with the various difficulties to be overcome in flying airplanes in tropical climates. He expressed the opinion that machines built, as at present, of wood are satisfactory so long as they are only to be flown in Egypt or Mesopotamia ; but when it comes to machines flying regularly between England and these countries metal construction will probably be necessary. Shrinkage of timber as a result of the climate he considered more of a nuisance than a danger, but he thought it desirable that wings should be sent out from England uncovered with fabric, as in any case they have to be stripped on arrival for adjustment of internal fittings. Conditions are a good deal worse in Mesopotamia than Egypt, chiefly owing to the very great changes in temperature and humidity of the atmosphere during the day. In the desert there are sudden changes in the direction of the wind, which are very disturbing. On one occasion, just after midday the wind kept changing from east to north and back again in a few seconds. Two hours later it had completely died down, while five minutes later it was blowing steadily from the West. Wastage in propellers is high, from splitting owing to heat and damage from small stones. Tires were another big item in upkeep, and petrol constituted a heavy expense owing to evaporation and the carelessness of native labor in handling the container. Provided that extra radiators are fitted there does not appear to be much engine trouble specially due to the climate either in Egypt or Mesopotamia.

Hopping Off the Cliff

A CONTRIBUTOR to *The Motor* (South Africa) states that, according to stories told by the natives of Hawaii, all the thrills of flying were enjoyed by the Hawaiians centuries ago. Their ancestors secured their aerial excitement by jumping off cliffs into the sea in home-made airplanes. They made a regular game of it, known as "lele pali," or "jumping from the cliff." It was played up to a hundred years or so ago by natives who lived near groves of loulu palms, near high cliffs overlooking the sea. The game was played with large contrivances built of light but stout sticks and overwoven with loulu palm leaves. Several of these affairs were made ready, the Hawaiian "aviators" took their seats and were pushed over towering cliffs. The adventurer who remained longest in the air was the winner. Frequently an airplane, owing to the carelessness or over-excitement of its "pilot," executed a nose dive after the fashion of the twentieth century machines. The only damage was the loss of the game. Old Hawaiians say that their flying men were exceptionally skilful. The only means they had of guiding their crude appliances was to shift their weight to maintain balance as they zigzagged down toward the sea. A fleet of outrigger canoes was anchored off shore to pick up the sportsmen and retrieve the "planes." Exceptionally daring Hawaiians, it is said, often hopped off thousand-foot cliffs on the mainland.

Progress of Civil Aviation in Great Britain

IN a memorandum on the development of civil air communications within the British Empire, prepared by the department of civil aviation, it is stated :

"The development of communications is one of the most important phases in the growth of modern civilization, which depends to an ever-increasing extent on the interchange of thought and the intercourse of individuals. Steam, cable and wireless have each in turn been evolved to expedite intercommunication, but just as the roads of the Roman empire failed to keep pace with the requirements of the time, so modern communications are insufficient for an empire stretching from Great Britain to Australia and the Pacific Ocean. Cable and wireless are limited in scope ; yet, as each portion of the empire assumes greater responsibility, there is a greater need for co-operation, the distribution of information, and the personal contact of statesmen. That necessity is the mother of invention is a motto particularly applicable to modern conditions, and by discovering how to fly human ingenuity has taken a further step in solving the problem of communication so essential to the existence of our empire.

"Civil aviation aims at the building up of a productive organization to a position similar to that held by our mercantile marine."

Non-Stop Flight Competition in Japan

The fourth non-stop mail flight, open to civilian aviators, held under the auspices of the Imperial Aviation Society on November 3rd, was participated in by six entrants, only two of whom covering the prescribed distance of 362.5 from Kanazawa and Hiroshima. The planes used were either made in Japan or reconstructed from foreign planes. Neither of the two successful entrants covered the prescribed distance within the time limit of four hours, the time for the plane finishing first being 4 hours and 10 minutes, and for the second 5 hours and 33 minutes.

Airplane Markings in Japan

The mark of recognition for the airplane is a sun in red, displayed at each end of the upper surface of the upper wing and of the under surface of the lower wing, as well as on each side of the body (or on each side of the frame if the machine is of the frame system). The name of the airplane is displayed above the number on the rudder, and the number is displayed in Arabic figures on each side of the rudder, or on each outer side (if there are two or more rudders) and on the under surface of the lower wing with its head to the front.

France

Two French airmen, MM. Deulin and de Marmier, have brilliantly mapped out the Paris-Constantinople air route by their initial flight out and back in 35 hours of actual flying. After leaving Paris they made long halts at Strasbourg, Prague, Budapest, Belgrade and Bukarest. The distance of 1,770 miles from Paris to Constantinople was covered in 17 hours of effective flight. The return journey from Constantinople to Paris was made in 18 hours of actual flight.

International Aviation Races in Italy

THE Italian minister of war has just approved a plan submitted by the chief of air service (Comando Superiore di Aeronautica) for several big international aviation races and competitions to take place in September, 1922. The object of these competitions is to increase the creation and construction of new types of airplanes, and prizes will be taken from air service funds appropriated for that purpose.

The first race will be known as the "Grand Prize of Italy" and will be for airplanes. The prizes for this competition will consist of a cup valued at 30,000 lire, a first prize of 150,000 lire and a second prize of 50,000 lire.

The second race will be known as the "Grand Prize of the Tyrrhenian Sea" and will be for seaplanes. In this competition the prizes will be of the same amounts as those for the "Grand Prize of Italy."

In addition to the prizes, 400,000 lire will be spent for the purchase of the Italian airplanes which make the best showing in these two competitions. As at present outlined, each race will be 2,000 kilometres over a circuit not less than 500 kilometres in length. In addition to these two races, it has been decided to have

parachute competitions, the descents to be made from airplanes. Prizes to the amount of 500,000 lire will be awarded in the parachute competitions, which will also be international.

There will be held also a competition for free balloons, the money prizes in this competition amounting to 30,000 lire.

As soon as the detailed regulations governing the above competitions are drawn up information thereon will be forwarded.

Prior to his appointment, the new minister of war was a member of a group of fifty representatives in the Italian house of representatives known as the "Aeronautical Group." This group is made up of representatives from various political parties, organized and pledged to support and assist in all legislative matters for the organization and development of commercial aeronautics. Up to the present time this group has not succeeded in getting any of its proposed legislation through the house. A similar organization has just been organized in the senate along the same lines and for the same purposes. It consists of from 40 to 45 members at present, including many of the most prominent senators, in addition to those who are most prominent in industry and science.

Camp Nichols, P.I., Now an Air Service Station

THE clearing house for Philippine scout recruits for years—Camp Nichols, P.I.—has been converted into an air service station. The old post has been awakened from its peaceful slumber of contentment, the air service troops are policing up the old post, and the interest they take in it is admirable. The quartermaster corps is employing a gang of natives to clear so much of the camp that is to be converted into a flying field. Large trees and innumerable clumps of bamboo are being uprooted by means of a steam roller. Filling and grading are being done by means of plows and harrows. When the new field is completed it will be as level as a billiard table, and will be approachable from all directions. Camp Nichols is located in the suburbs of Manila, and is considered an ideal station.

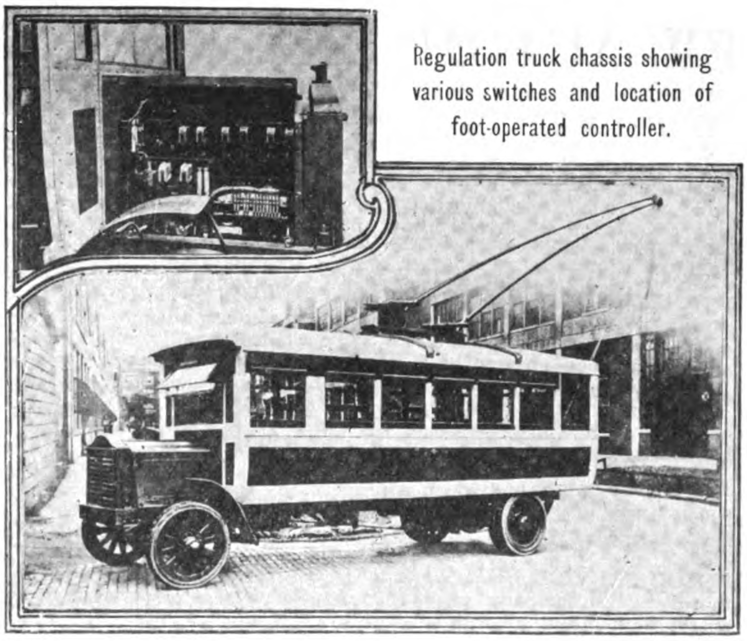
The field is of an "L" shape, the foot of the "L" being slightly over 500 yards in length and the leg of the "L" something over 650 yards in length. The construction of the field for the $5,000 which has just been authorized by the war department will tend to make it one of the most inexpensive fields ever provided for the air service. By having this field and also the $10,000 field to be constructed on Corregidor, all heavier-than-air craft will then be able to fly between, and land at, all stations. The flying field on Corregidor will not be a school airdrome, but one from which service flying can be very readily carried on.

Italy

The Italian publication *The Matin* reports the invention in Italy of a dirigible carrying 90 passengers and a crew of 23. Instead of employing ordinary gases, the ship is enabled to rise by the rarefaction of the air itself within the machine. The machine was built of duralumin, the lightest kind of metal, and consists of a series of concentric chambers, enabling the air to be rarefied in each to such an extent that it becomes lighter than the air outside and the machine is enabled to rise. The process is carried on by machinery connected with motors, and can be varied so as to enable the ship to rise or fall and move at varied speeds.

Siam

During his "round-the-world" journeying, Lord Northcliffe made a stay at Bangkok, and on December 23rd he visited the airdrome at Don Muaung, where Sir Ross Smith alighted during his Australian flight in 1919. The London *Times* correspondent states that Lord Northcliffe was surprised to find the air station equal to most of those in Europe. Siam, he states, has 25 landing places and five airdromes. At Don Muaung there are 115 planes, including school machines and a staff of 650 men.



Regulation truck chassis showing various switches and location of foot-operated controller.

New Vehicle Combines Good Points of Street Car and Gasoline Bus

WITHIN the past few months there has been developed and tested, with satisfactory results, as an adjunct to street car service, the trolley bus, a combination of the gasoline bus and the trolley. The vehicle consists of a regulation bus chassis with a 25-seat body, which is propelled by electric motors, with their control apparatus mounted under the regulation automobile hood. Power is derived from an overhead wire.

From the standpoint of operation the new bus which as now developed has the standard chassis of the Packard truck with electrical equipment furnished by the Westinghouse Electric & Manufacturing Company, has many points in its favor. Two of these reasons follow. Due to its automobile construction it does not need tracks and therefore can draw up to the curb of the street to receive and discharge passengers. It also can dodge with ease trucks or wagons which are directly in its path and thus is not subject to the irritating delays and consequent loss of schedule which constantly interrupt the street car service of nearly every metropolis.

This trolley bus recently tested in Detroit, weighs 11,500 pounds, including two 18-foot trolley poles which may be seen in the illustration. Of the total weight 6,770 pounds is carried on the rear axle so that the weight is very evenly balanced on front and rear axles, a feature that makes the bus very attractive to the transportation official. The propulsion equipment consists of two 25 horse-power Westinghouse ball-bearing motors mounted in tandem and coupled together and to the propeller shaft with flexible couplings.

One feature that the trolley bus has and which permits of one-man operation is a foot controller. The pedal of the foot controller occupies the same place in the cab as the automobile accelerator while the control equipment is located under the hood. In fact the entire appearance of the hood has not been changed an iota, the only difference being that instead of a noisy gasoline engine there is installed electric control apparatus whose silent operation is in direct contrast to the noisy internal combustion engine.

As developed at present the trolley bus is not designed to replace the street car but is merely to act as an adjunct to street car service. It has proved that it is capable of very flexible service and there have been some prophets who go so far as to say that within the next few years the trolley bus will entirely supplant the jitney for city service.

NEW AUTOMOBILE COMPANIES, ROADS, ETC., IN CHINA

AUTO BUS COMPANY UNDER ORGANIZATION IN HONAN.—The ministry of communications has received an application from Mr. Lee Mao-ping asking for permission to organize an auto bus company, to operate a service from the mouth of the Lan-feng-ho river to Tsi-yuen, Honan, with a capital of $50,000. The application has been referred to the provincial authorities of Honan for investigation, and if satisfactory, approval will be granted.

AUTO BUS SERVICE ON CHEFOO-WEIHSIEN MOTOR ROAD.—Since the notification was issued by the ministry of communications calling for reliable merchants to operate an auto bus service on the newly-built Chefoo-Weihsien motor road on franchise, two Chinese capitalists named Chang and Chiang have applied to the provincial authorities of Shantung asking for permission to undertake the enterprise with a capital of $1,250,000. The request is now under consideration by the ministry.

A MODERN ROAD IN SZECHUAN.—The survey of a modern road from Chengtu to Chungking, which is proposed by the Chungking port improvement works bureau, has been started, Mr. Chow Tsing has been appointed to take charge of the bureau.

MOTOR SERVICE BETWEEN KALGAN AND TU-LUN-HSIEN.—The motor service company established by the defence commissioner at Kalgan for running automobiles between the city and Tu-lun-hsien, an important town in Jehol, has recently inaugurated its service. The journey can be finished in one day's time and the single fare for each passenger is charged at $20, each passenger being allowed to carry parcels not exceeding 20 catties in weight.

GOOD ROAD MOVEMENT STARTED BY FOREIGNERS.—The American consul-general at Nanking has lately written to the military and civil governors of Kiangsu, asking for approval of the plan formulated by the Chinkiang Chinese and foreign famine relief association for the construction of a motor road from Chinkiang to Tong-shan at Nanking with famine sufferers' labor.

CONSTRUCTION WORK ON CHEKIANG-FUKIEN PROVINCIAL ROAD STARTED.—An engineering conference of the Chekiang provincial roads bureau was held on March 18th to discuss the necessary measures to be taken in connection with the proposed work. In the conference, it was decided that the Chekiang-Fukien line would be started on March 22nd and that three road construction sub-departments will be established at Hsiao-shing, Linghai and Yung-chiar respectively.

SHANGHAI - MINGHONG - NANWEI - CHOLING AUTOMOBILE ROAD TO BE PROLONGED.—The Shanghai-Minghong-Nanwei-Choling Automobile Transportation Company is planning to prolong its line from Choling to Chapoo and Haining, two important towns in Chekiang, where marine products are abundant and adequate means of transportation are urgently needed. There is a long embankment leading to Haining from Choling and part of it can be made use of for running the automobile service.

CONSTRUCTION COST OF CHEKIANG-ANHWEI PROVINCIAL ROAD.—After careful survey by Mr. Chen Shu-tang, engineer-in-chief, it is estimated that the Chekiang-Anhwei provincial road from Chien-tang-men, Hangchow, to Sze-an-ching, Wuchow, a distance of 234 *li*, will cost $1,170,000 or an average of $5,000 per *li*. On the whole line there will be constructed 67 bridges calling for an expenditure of $600,000 of which one-third will be spent in building two large bridges over Mai-chee in An-kien-hsien and over Nan-chee in Wu-kong-hsien, each with a length of 300 feet. According to the estimate, a total amount of $2,000,000 will be needed in the work including the purchase of auto buses, construction of stations, offices, etc.

SHORT MODERN ROAD UNDER CONSTRUCTION, ANHWEI.—With an appropriation of $100,000 by the Chinese and foreign famine relief association, the construction of an automobile road from Hwai-yuen to Pengpu, Anhwei, a distance of little more than 20 *li*, has been started.

AUTOMOBILE ROAD IN WESTERN HONAN PLANNED.—The military and civil governors of Honan have decided to construct an automobile road between Kwai-ying-dong to Dong-kwai in place of the railway, as the construction of the former will call for a smaller expenditure than that of the latter. Two engineers, Messrs. Hwang Pao and Liu Jen, have been sent to make survey of the road and construction work will be started very soon.

AMALGAMATION OF TWO PROPOSED AUTO BUS COMPANIES.—The Soochow Automobile Transportation Company promoted by Mr. Pan Tze-nee, of Soochow, will be amalgamated with the Soochow-Kashing-Wuchow Automobile Transportation Company which is now under organization.

AUTO BUS SERVICE, NANTUNGCHOW.—The Nantungchow road construction department has decided to introduce automobile transportation service into the whole district of Nantungchow; at present auto bus service is only operated in the Chong-kong, Shan-zai and King-sha-sze villages.

NORTH MANCHURIA AUTOMOBILE TRANSPORTATION CO. PROPOSED.—Mr. Chi Hung-kwai, a wealthy merchant of Heilung-kiang, has proposed the organization of the North Manchuria Automobile Transportation Company with a capital of $100,000 to operate a service between Tsitsihar, Harbin, Tao-nan and other important places in North Manchuria.

DUN-CHEE-YUEHONG AUTOMOBILE ROAD PROJECTED.—Some leading merchants of Hwei-chow, Anhwei, have proposed the building of an automobile road from Dun-chee, Anhwei, to Yuehong, Chekiang. As there are many hilly districts between the two pints, the work will involve engineering difficulties and, according to estimate will call for an expenditure of about $1,500,000.

1,010-LI MODERN ROAD UNDER PROJECTION IN KWANGTUNG.—The important merchants of Chao-ching-fu, Kao-yao-hsien, Kwang-ning-hsien and many other neighboring districts in Kwangtung are contemplating the building of district roads in 80 sections, with a total length of 1,010 *li* extending to twelve cities in the province. When completed, these projected roads will lead to the Canton-Samsui and Ning-Yang railways. A detailed map showing all the roads has been submitted to the provincial authorities for approval.

NEW BRIDGES ON GEEHSIEN-TINGHSIANG-WUDAN AUTOMOBILE ROAD.—On the Geehsien-Tinghsiang-Wudan motor road, Shansi, stronger bridges will be built so as to allow heavy freight trucks to pass. The fund for the purpose is to be appropriated by the three districts concerned.

AUTO BUS SERVICE BETWEEN NANTUNGCHOW AND HAIMEN.—A number of automobiles have been ordered from Shanghai by the Nantungchow-Haimen Automobile Transportation Company, recently organized by the leading merchants of the two cities. It is expected that service will be inaugurated at the end of this month.

TSINAN-LOKOW AUTOMOBILE ROAD OPENED TO TRAFFIC.—The automobile road from Tsinan to Lokow, Shantung, has been completed, and automobile transportation service was started on March 27, 1922, by Messrs. Lao Sun-wu and Sung Po-shan.

SIAN-DUNGKWAI AUTO BUS COMPANY PLANNED.—Mr. Woo Kwang-shee, chairman of the Shensi provincial assembly, and Mr. Kuo Yu-chong, chairman of the chamber of commerce at Sian, have planned the organization of an automobile transportation company to operate a service from Sian to Dungkwai. It is reported that the proposal has received the favorable approval of the military and civil governors of the province.

AUTO BUS SERVICE BETWEEN SHANGHAI AND WOOSUNG.—Some time ago it was proposed to establish an automobile company operating a service from Shanghai to Woosung, but the plan was dropped owing to the fact that the newly-built road was not solid enough for such an enterprise. With repair works carried out during the past two years, the conditions of the road have been greatly improved and some Chinese capitalists are again planning to take up the long-proposed enterprise. An engineer has been appointed to investigate the conditions of the road.

AMERICAN PHILANTHROPISTS TO BUILD MOTOR ROAD IN CHINKIANG.—Upon request of the Chinese and Foreign Famine Relief Association at Chinkiang, the American consul-general at Nanking has written to the military and civil governors of Kiangsu asking for permission to construct a motor road from Chinkiang to Tong-sui connecting with the existing Tong-sui—Nanking automobile road with famine sufferers' service under direction of the association.

SHANGHAI - MINGHONG - NANWAI - CHOLING AUTOMOBILE ROAD.—The construction work on the Shanghai-Minghong-Nanwai-Choling automobile road has been started and it is expected that the first section between Shanghai and Ming-hong will be completed in May and that automobile service will be inaugurated on June 1st with eight buses.

NANTUNGCHOW-SHUKAO-HAIMEN AUTOMOBILE TRANSPORTATION COMPANY.—With the district roads in Nantungchow, Shu kao and Haimen, Kiangsu completed, the gentry of these three neighboring cities have decided to organize an automobile transportation company to run a service between these cities. The company is capitalized at $15,000 divided into 300 shares of $50 each. It is reported that five automobiles have been ordered from Shanghai and that the shipment will arrive at Nantungchow in the near future.

AUTOMOBILE ROAD BETWEEN KIUKIANG AND CHING-TEH-CHING, KIANGSI.—An automobile road from Kiukiang to Ching-teh-ching, the most famous porcelian centre of China, will soon be constructed by the leading merchants of the two cities. The projected line measures bout 200 *li* in length and when completed the journey will take four hours. According to estimate, a fund of $1,000,000 is needed for constructing the road and the purchasing of auto buses. At present an amount of $100,000 has been collected and the balance is being raised in the leading cities of the province.

REGISTRATION OF SHANGHAI-TAITSANG MOTOR SERVICE COMPANY.—The Shanghai-Taitsang Automobile Transportation Company, which has inaugurated a service from Shanghai to Tazang on January 1st, has been officially registered with the ministry of agriculture and commerce. At its recent shareholders' meeting, it was decided that the automobile road would be prolonged from Taitsang if the daily receipt exceeds $300 during the forthcoming three months after through service starts.

AUTOMOBILE ROAD FROM ANKING TO ZIH-YIEN-KWAI.—The Anhwei provincial road construction bureau has started to build an automobile road from Anking to the North suburb known as Zih-yien-kwai, a distance of 25 *li*, with famine labor. An appropriation of $20,000 has been made by the Anhwei civil governor, but according to estimate the fund allocated is not enough to cover the expense.

It is learned that parallel to the automobile road now under construction, there will be built another macadamized road on which heavily loaded freight cars are allowed to pass.

SOOCHOW-KASHING-WUCHOW AUTOMOBILE ROAD.—A temporary office of the Soochow-Kashing-Wuchow Automobile Transportation Company has been established. The company is capitalized at $3,000,000 divided into 150,000 shares of $20 each. According to estimate, when the motor service is inaugurated, a net profit of $1,050,000 will be made annually.

It is learned that another automobile road from Sze-an-ching in Chang-shun-hsien, terminus of the Soochow Kashing-Wuchow line, to Kwang-teh-hsien in Anhwei will be built, connecting with the Soochow-Kashing-Wuchow line.

HANGCHOW-YUEHONG AUTOMOBILE ROAD.—The Hangchow-Yuehong Automobile Transportation Company, which is under organization, has been officially registered with the Chekiang provincial government and is now soliciting subscriptions for capital. The company is to be capitalized at $300,000 with 60 shares of $50 each. Up to date, an amount of over $200,000 has been raised.

PLAN AUTOMOBILE SERVICE BETWEEN YUEHSIEN AND HSUCHONG.—The gentry of Yuehsien and Hsuchong, Honan, have decided to establish an automobile transportation company to run a service between the two cities. The automobile road is under construction and is expected to be opened to traffic in May, 1922.

AUTOMOBILE SERVICE IN SHANTUNG.—The Tsinan-Lokow Automobile Transportation Company, Shantung, inaugurated its service on March 1st with about ten buses, each capable of accommodating 20 passengers.

The motor road from Yu-chen to Tung-chong, which was constructed by the American red cross, has been handed over to the Shantung provincial authorities. It is learned that a certain Mr. Pao has applied to the Chinese officials for the operation of a motor service on the red cross road and that his application has been received favorably.

CHONGCHOW-SHIHCHIACHONG SECTION TO OPERATE MOTOR SERVICE.—Mr. Chang Ching-jao has applied to the ministries of agriculture and commerce and communications asking for permission to operate an automobile service on the proposed railway line from Chongchow to Shihchiachong, Chihli, of which the foundation work has been completed.

MOTOR ROAD TO CONNECT NANTUNGCHOW WITH SHUKAO.—With a view to facilitating communications, the gentry of Nantungchow and Shukao, two neighboring districts in Kiangsu, have planned the construction of an automobile road between the two districts. A survey is being carried out and construction work will be started very soon.

MARKET FOR MOTOR VEHICLES IN CHEKIANG.—A number of auto buses will be soon ordered for service on the projected Chekiang-Fukien provincial road, Chekiang-Anhwei provincial road, Hangchow-Yuhong, Haining-Changan and Ningpo-Fenghua-Chinghai automobile roads, some of which are under construction. Mr. Yue Teh-lan, engineer-in-chief, has taken the matter of purchasing buses with the military governor of Chekiang.

CHEFOO-WEIHSIEN AUTOMOBILE ROAD.—The ministry of communications has drawn up a set of regulations containing seven articles governing the management of the Chefoo-Weihsien automobile road and the organization of an automobile transportation company to operate a service thereon on franchise.

LUNGKOW-WEIHSIEN AUTOMOBILE ROAD COMPLETED.—The Lungkow-Weihsien automobile road in Shantung had been completed and auto-bus service thereon was inaugurated on March 1st, 1922.

MOTOR ROAD COMPLETED AT NANTUNGCHOW.—An automobile service has been inaugurated on the Shan-maloo road, Nantungchow.

CONSTRUCTION OF HANGCHOW-YUHONG AUTOMOBILE ROAD PROGRESSING.—The Hangchow-Yuhong Automobile Transportation Company, organized by Messrs. Koo Nai-ping and Chang Ying-ching, with a capital of $300,000 divided into 6,000 shares of $50 each, has recently secured registration with the ministry of communications. The projected line is to start from Kwai-ying-jao, Ho-sze, Hangchow, and end at the suburb of Yuhong. Two large stations will be established at Hangchow and Yuhong with smaller ones at Ho-sze, Tung-ngao, Liu-sha and Yen-ling-poo. At present offices have been established at Pan-er-hong, Hangchow, and Hsiao-lung, Yuhong, respectively.

PEKING TIENTSIN AUTOMOBILE ROAD.—The construction of the Peking-Tientsin automobile road has been started under direction of the local police authorities and Mr. Hsuan Shee-ling.

TRANSPORTATION FACILITIES IN CHENG-KIANG, KIANGSU.—An automobile transportation company is being organized to operate a service from Wusih to Cheng-kiang, by the local authorities.

TWO IMPORTANT HIGHWAYS IN HUPEH, PROPOSED.—Mr. Pao Ching-yue has proposed the construction of two important automobile roads in Hupeh, one from Hsiang-yang to Shatze and the other from Hsiang-yang to Kwang-sui viâ Ying-shan, connecting with the Peking-Hankow railway. The proposal is under consideration by the local authorities.

ROAD CONSTRUCTION IN SZECHUAN.—Under the leadership of Mr. Chow Ching, the director of the Szechuan provincial road bureau, the construction of the important highway from Chengtu to Chungking is steadily going on. Another modern road at Kiang-pei has been started.

AUTO-BUS SERVICE ON NEWLY-BUILT CHEFOO-WEIHSIEN ROAD.—In reply to the advertisement of the ministry of communications calling for reliable merchants to operate an auto-bus service on Chefoo-Weihsien motor road on franchise, Messrs. Chang Shi-gee and Chiang Pong-song, general manager and assistant manager of the Lungkwo Port Construction Company, at Lungkow, Shantung, have applied to the provincial authorities of Shantung for the privilege. The request has been referred to the ministry of communications for consideration.

SOLDIERS ASSIGNED TO CONSTRUCT CHEKIANG-FUKIEN PROVINCIAL ROAD.—The construction of the Chekiang-Fukien provincial road has been started with 3,400 soldiers under control of General Lu Yung-Hsiang, tuchun of Chekiang. The line is divided into 17 sections as follows:

(1) From Tih-ling-kwai, Si-shun, to Chien-ching-ching, 40 *li*.
(2) From Chien-ching-ching to the city of Hsiao-shun, 45 *li*.
(3) From the city of Hsiao-shun to Sung-chiar-zai, 36 *li*.
(4) From Sung-chiar-zai to Tso-yuen-der, 26 *li*.
(5) From Tso-yuen-der to the city of Chen-hsien, 25 *li*.
(6) From the city of Sing-cheng-hsien to Kwai-ling, 52 *li*.
(7) From Kwai-ling to Tien-den-hsien, 40 *li*.
(8) From Tien-dan-hsien to Chung-doo-ching, 50 *li*.
(9) From Chung-doo-ching to Ling-hai-hsien, 50 *li*.
(10) From Ling-hai-hsien to Hwang-ngai-hsien, 52 *li*.
(11) From Hwang-ngai-hsien to Shih-kuo-ching, 50 *li*.
(12) From Shih-kuo-ching to Song-gee-kong, 40 *li*.
(13) From Song-gee-kong to Ching-kiang-doo-kow, 40 *li*.
(14) From Ching-kiang doo-kow to Liu-sze-ching viâ Hung-jao-ching, 55 *li*.
(15) From Liu-sze-ching to Wenchow, 50 *li*.
(16) From Wenchow to Ting-dien-ching in Sui-an-hsien, 40 *li*.
(17) From Ting-dien-ching to Ping-yang-hsien, 50 *li*.

DUNGCHEE-HANGYUE AUTOMOBILE COMPANY PROPOSED.—Some Anhwei merchants residing in Shanghai such as Messrs. Woo Dih-ching, Lee Tan-foo, Wang Zing-poo, etc., have proposed the organization of an automobile transportation company with a capital of $1,500,000, with 30,000 shares, for operating a service from Dungchee, a town in Hweichow, Anhwei, to Hangyue, Chekiang, viâ Yue-chien and Chong-hua in Chekiang.

SOOCHOW-KASHING-WUCHOW AUTOMOBILE ROAD.—The Soochow-Kashing-Wuchow Automobile Transportation Company which is under organization will amalgamate with the Soochow Auto Bus Service Company proposed by Mr. Pan Tze-nee. The projected lines have been re-adjusted as follows:

(1) The Soochow-Kashing main line is to start from Soochow and end at Cha-poo, Chekiang, viâ Woo-kiang, Ping-wang, Pei-cha, Chen-shih, Wang-kiang, Ka-shing, Sing-foong and Ping-ho, with a branch line from Dung-ting to Dung-hsiang viâ Tung-shan, Kwang-foo, Dung-lee, Li-lee and Po-yuen.

(2) The Soochow-Wuhu main line is to start from Soochow and end at Kwang-teh, Anhwei viâ Woo-kiang, Pei-cha, Tseng-shih, Nan-zing, Ju-kwai-tze, Wu-chow, Chang-shun and Sze-an, with a branch line from Wu-ching to Hangchow viâ Liang-ho, Sing-tze, Wu-kong and Tien-mo-shan.

(3) The Soochow-Taichong main line is to start from Soochow and end at Taichong, connecting with the Shanghai-Taichong line.

(4) The Soochow-Changzao main line is to start from Soochow and end at Foo-shan-ching viâ Changzao with a branch to Tong-kow.

MODERN ROADS IN ANHWEI.—At a recent meeting of the provincial road construction bureau of Anhwei, four important provincial highways were mapped out:

(1) From Anking to Chin-teh-ching, Kiangsi, viâ Tung-liu and Chiu-poo.
(2) From Wuhu to Kwang-teh viâ Hsuan-chen and Long-chee.
(3) From Wuhu to Tun-chee-ching viâ Shih-dien, Tai-ping, Tsing-teh, Tsi-chee, Shi-hsien and Shu-ning.
(4) From Anking passing through Sze-chen and Hur-vee, thence one line leading to Loa-an and another to Pengpu.

Of the above proposed roads, the ones from Wuhu to Kwang-teh, Anking to Loa-an and Anking to Pengpu will be built first, as the local gentry have decided to take up the construction work.

Another motor road from the north suburb of Anking to Feng-sui-poo viâ Wu-lee-tun and Chih-yien-kwan, a distance of 25 *li*, is also being considered. This road, though rather short in distance, is a most important highway leading to the capital of the province, and construction work on it will be soon carried out with famine sufferers' labor. For facilitating communication, another automobile road surrounding the city of Anking will be built.

AUTOMOBILE SERVICE IN SHANSE.—Automobile transportation services from Taiyuenfu to Cheng-hsien viâ Gee-hsien and Wu-dan in the north and from Taiyuenfu to Pin-yao viâ Feng-yang and Chi-hsien in the south, Shansi, were officially inaugurated on April 15.

MOTOR SERVICE COMPANY PROPOSED IN SHANTUNG.—Mr. Ma Vee-yien, of Shantung, is associated with a number of capitalists for the organization of an automobile transportation company to run a service from Tsining, Shantung, to Kaifeng, Honan. It is stated that automobiles have been ordered from Tientsin.

AUTOMOBILE TRANSPORTATION SERVICE IN SHANG-TSAI-HSIEN.—A motor road from Si-ping to Chow-chiar-kow in Shang-tsai-hsien, Honan, has been completed and an automobile transportation company to operate a service on the new road has been established with a capital of $50,000. A shipment of more than ten auto buses has been supplied by the Jardine, Matheson & Co. at Hankow, and service will be inaugurated very soon.

CHENGTU-KWAIHSIEN AUTOMOBILE ROAD STARTED.—The construction work on the Chengtu-Kwaihsien automobile road, Szechuan, a distance of 120 *li*, which is to have a width of 18 feet and is to be macadamized, has been started. The construction of another important line from Chengtu to Chungking will be postponed for some time.

AUTOMOBILE SERVICE BETWEEN WEIHSIEN AND LUNGKOW, SHANTUNG.—Automobile service from Weihsien to Lungkow, Shantung, has been inaugurated. Incompletion of a bridge over the Hwai-ho, still necessitates the use of ferry boats at this point.

TWO AUTOMOBILE TRANSPORTATION COMPANIES UNDER ORGANIZATION.—Mr. Lee Hung-ping of Honan and Mr. Chang Ching-jao of Chihli have applied to the ministry of communications for permission to organize the Kaifeng-Tsiyuen Automobile Transportation Company and the Chongchow-Shihkaichong Automobile Transportation Company respectively.

CHING-TSI-HWANG-CHIAO AUTOMOBILE TRANSPORTATION COMPANY.—Messrs. Kuo Ping, Wai Hsiao-yu, Lu Ting-liang and others have organized an automobile transportation company to operate automobile services from Ching-hua to Chiao-wai-ying and from Hwang-ho-jao to Tsi-yuan. The company will not construct any motor road but will rent the old roads from the Honan provincial government on franchise. However, it is necessary for the company to repair the road along the projected line. The line is 280 *li* in length, 5 per cent. of the total yearly profits will be paid by the company as rent. Some branch lines are under consideration, of which, the one from Ching-hua to Sing-yang-hsien will be constructed first. The company is capitalized at $150,000 in 300 shares of $500 each and has been officially registered with the Honan industrial bureau.

The estimated expenditures in connection with the enterprise are given in the following itemized statement:—

Cost of Land.—The cost of land for constructing the road from Chiao-wai-ying to Ching-hua and for stations, offices and auto-bus sheds is estimated at $10,000.

Earthwork.—Earth required for widening, filling and grading the new road and some parts of the old roads will cost about $10,000.

Surfacing.—Gravel for surfacing the old roads and the new road from Ching-hua to Chiao-wai-ying will cost about $10,000.

Bridges.—Three bridges are to be built and are estimated to cost $10,000.

Buildings.—Sixteen stations, auto-bus sheds and machine shops will be erected and are estimated at about $10,000.

Automobiles and Road Roller.—Four passenger cars at $7,000 each, four trucks at $5,000 each, two small cars at $1,000 each and one road roller at $1,000 will be purchased, making a total of $55,000.

Tree Planting.—About 24,000 trees will be planted along the road, at an expenditure of $1,000.

Furniture and Fixtures.—Telephones, allowances to police stations for additional policemen, surveying apparatus, furniture and fixtures for the various stations are estimated at $10,000.

Reserve Fund.—A fund of $14,000 is set aside to provide for deficits in the above itemized costs.

ESTIMATED EXPENDITURES IN CONNECTION WITH THE CONSTRUCTION OF THE SOOCHOW-KASHING-WUCHOW AUTOMOBILE ROAD.—The estimated costs of building the Soochow-Kashing-Wuchow highway are placed at about $3,000,000, given in the following itemized statement:—

Cost of Land.—About 8,340 *mow* of land will be required for constructing the road measuring 696 *li* long and 40 feet wide, estimated at $50 per *mow*, or a total of $417,000. Other expenses and allowances for the removal of tombs, houses, etc., the total cost of land is placed at $440,000.

Earthwork and Surfacing.—A total of about 500,400 *fond* of earth is estimated as necessary for filling, grading, etc., costing about 60 cents per *fond* including cost of sand for surfacing, or a total of $600,480.

Stone and Gravel.—The road is to be covered with gravels on which two stone rails, each with a width of 1-ft. and a depth of 5-in. will be laid. It is estimated at $300 per *li*, or a total of $208,500.

Bridges.—There will be built 253 bridges which is placed at $506,000, at an estimated average cost of $2,000 each.

Automobiles.—100 passenger cars at $6,000 each and 60 trucks at $4,000 each, a total of $840,000.

Buildings.—The ten large stations at Soochow, Pingwang, Kashing, Chapoo, Nanzing, Wuchow, Chang-shun, Kwang-teh, Taichong and Chang-zao, which are to have offices and dormitories attached, will cost $50,000 and the small stations at other places will cost $25,000, making a total of $75,000.

Tree Planting.—About 100,000 trees will be planted along the road calling for an expenditure of $10,000.

Furniture and Fixtures.—Telephones, allowances to police stations for additional policemen, surveying instruments, furniture and fixtures for the various stations are estimated at $80,000.

Road Rollers.—Four 9-ton road rollers at $10,000 each.

Reserve Fund.—A fund of $200,020 is set aside to provide for deficits in the above itemized statement.

When all the itemized estimates are added up, the total amounts to $3,000,000.

PROVINCIAL ROADS IN SZECHUAN.—In Szechuan province there will be built six important provincial roads which have been mapped out as follows:—

(1) From Chengtu to Chungking.
(2) From Chengtu to Van-hsien.
(3) From Chengtu to Ka-ting.
(4) From Chengtu to Kong-ting with a branch line from Han-yuen to Hwai-lee.
(5) From Chengtu to Kwai-hsien.
(6) From Chengtu to Kwang-yuen.

All of these projected roads are to have a width of 30 feet. The two lines from Chengtu to Chungking and from Chengtu to Kwai-hsien are to be built first under directorship of Gen. Chow Ching and Gen. Liu Chen-hsuan respectively. Besides these provincial roads, a number of district roads will be constructed. The fund for the work will be raised by issuing a public loan in the province.

REGISTRATION OF AUTOMOBILE TRANSPORTATION COMPANY.—The Hangchow-Yuehong Automobile Transportation Company which was promoted last year by Mr. Koo Nan-ping has been officially registered with the Chekiang provincial road construction bureau. Survey of the proposed road has been completed.

PROVINCIAL ROADS IN SOUTHERN FUKIEN.—The provincial road from Shih-mar to Chong-chow in Fukien has been opened to traffic, and another important road from Fur-kung to Chong-chow has been completed. At present the journey from Chong-chow to Amoy takes only three hours by automobile.

SOOCHOW AUTOMOBILE TRANSPORTATION COMPANY UNDER ORGANIZATION.—The Soochow Motor Service Company is being organized by Mr. Pan Lee-kuo with a capital of $52,000. An application for approval and registration has been made to the local authorities.

KIU TAH AUTOMOBILE TRANSPORTATION COMPANY.—Messrs. Yuen Chien-tze, Kao Yih-ting and Lee Chao-chu, of Chow-kow-ching in Sih-yih-hsien, Honan, are planning to organize the Kiu Tah Automobile Transportation Company to run a service from Chow-kow-ching to Len-ho, Honan.

Aviation Development in Italy

A POLICY of strict economy in army expenditures is to be inaugurated by the new Italian minister of war, the Hon. Gasparotto, who has been in office about five months. Both military and civil aeronautics in Italy are under the minister of war, and he recently made the following statement of his intentions concerning the air service:—

"It is my intention to cut down all branches of the army including the air service. The military air service will be kept within the limits strictly essential for proper war preparation. The development of civil aviation must be undertaken on a large scale. In this manner the appropriations for aeronautics will not be wasted in industrial ventures of which the state is always a most unfortunate administrator. The appropriations are to be spent wisely; for specific experiments, for the purchase of new material, for the preparation of the personnel and for equipping the various branches of the air service. As far as possible recourse will be had to private enterprises, stimulated by free competition, rather than to government establishments which are a burden to the state and are apparently kept up to maintain the employees in service. The plan for reforming and reorganizing the air service has been drawn up by the advisory committee for aeronautics, but the army air service must be duly considered and any reorganization must go hand in hand with the army organization.

"Civil aviation will receive the greatest possible support from the government, but always with the idea of developing and in full co-operation with the military air service. Thus, with a minor expenditure of money there will be created not only a strong air service for Italy's possible future defense, but also a source of industrial wealth and a large exportation."

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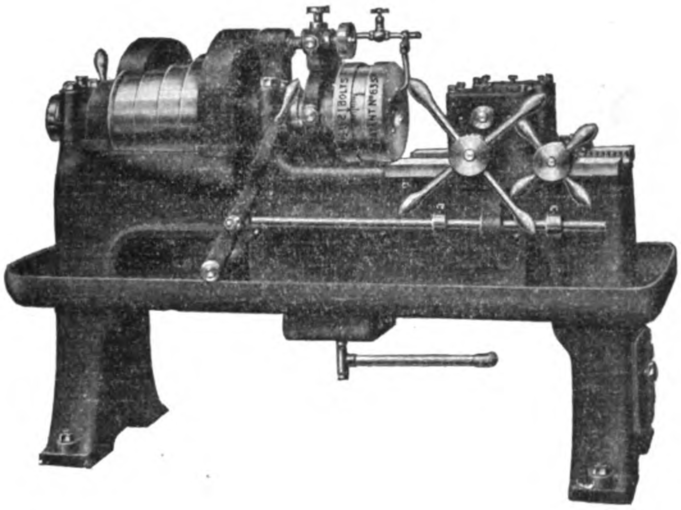

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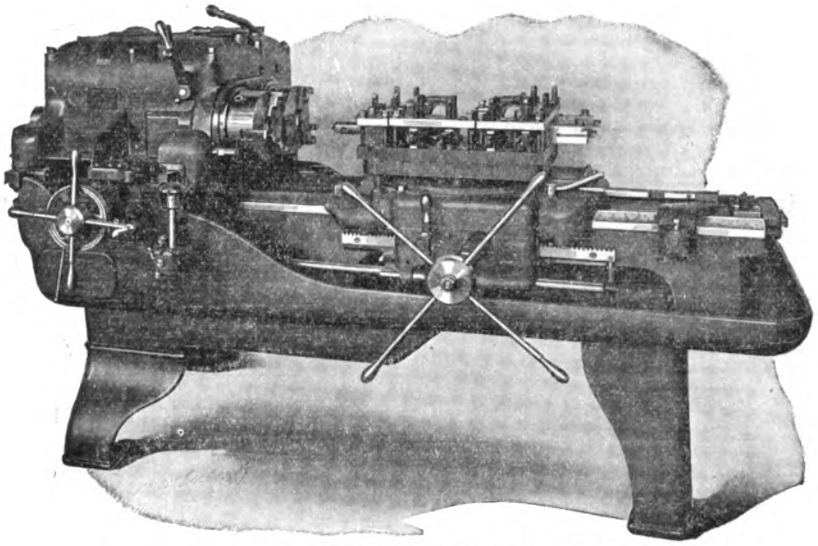

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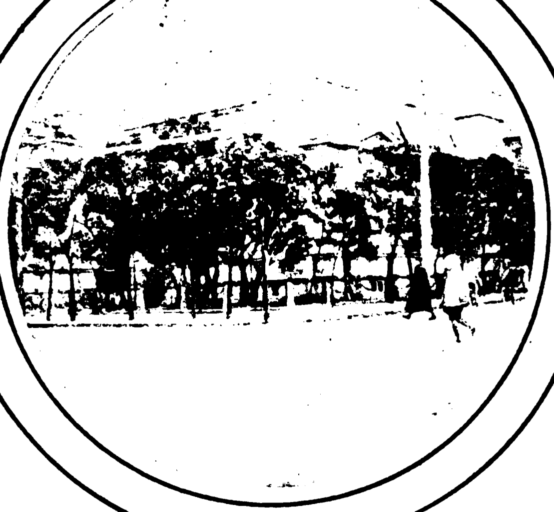

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OTHERS: Bangkok, Batavia, Bombay, Hongkong, London, New York, Semarang, Singapore, Soerabaya.

AGENTS AND CORRESPONDENTS:

In the Principal Cities and Towns throughout the World.

LONDON BANKERS:

BARCLAYS BANK, LTD. LLOYD'S BANK, LTD. LONDON COUNTY WESTMINSTER & PARR'S BANK, LTD.

TOKYO BRANCH:

No. 1, Eiraku-cho Ni-chome, Kojimachi-ku.

Telegraphic Address: "TAIWANGINK."

Phone Nos. 1060, 1061, 1062, 1063, 1064, 1065, 1066, 446, 447, 448 and 449, Marunouchi.

Interest allowed on Fixed Deposits, and Current Accounts on terms which may be ascertained on application. Most favourable terms are granted for Petty Current Accounts.

Every description of Exchange and General Banking business transacted.

Special facilities are available for exchange business on China, Straits Settlements, East Indies, Australia, Great Britain, Russia, America, Canada, South Africa, etc.

Industrial Bank of Japan, Limited

(NIPPON KOGYO GINKO)

Incorporated by Special Charter in 1902 to Encourage Foreign Investments

CAPITAL SUBSCRIBED - - - - -	Yen 50,000,000
CAPITAL PAID-UP - - - - - - -	Yen 45,000,000

HEAD OFFICE:

MARUNOUCHI, TOKYO. CABLES "KOGIN," TOKYO

BRANCHES:

TOKYO: NIHONBASHI
OSAKA: KORAIBASHI
KOBE: NAKAMACHI

H. HIJIKATA, Esq., President
Y. ONO, Esq., Vice-President
K. IYANAGA, Esq., Director
T. IWASA, Esq., Director
KOZO MATSUMOTO, Esq.

AUDITORS:

NAGATANE SOMA, Esq.
KINTARO HATTORI, Esq.
KINICHI KAWAKAMI, Esq.
TAICHI OHBA, Esq.

All descriptions of general banking, exchange, both foreign and domestic, and trust and corporation financial business transacted.

Correspondents in the principal cities at home, and in London, Paris, New York, and San Francisco.

BUSINESS TRANSACTED:

1.—Loans on the security of public bonds of debentures and shares, estates (Zaidan), specified land and buildings.
2.—Subscription and underwriting public bonds or debentures.
3.—Deposits and safe custody of valuables.
4.—Trust company business.
5.—Discounting of bills.
6.—Foreign exchange business.
7.—Other banking business sanctioned by the Minister of State for Finance in accordance with Law of Ordinance.

BANK OF COMMUNICATIONS

(Specially authorised by Presidential Mandates of April 7th, 1914 and October 31st, 1915 making the Bank of Communications a National Bank).

Head Office: Peking

CAPITAL . . Kuping Tls. 10,000,000

President: TSAO JOU LIN

Vice-President: JEN FUNG PAO

Every description of Banking and Exchange business transacted.
Interest allowed on Current Accounts and Fixed Deposits according to arrangement.
Credits granted on approved Securities.
Special Facilities for Transfers to all parts of China.

Branches

CHIHLI PROVINCE.—Peking, Tientsin, Tungchow, Paotingfu, Haitien, Tangshan, Shuntefu, Shengfang.

SHANTUNG PROVINCE.—Tsinanfu, Tsininchow, Chefoo, Techow, Tsaochwang, Lungkow.

HONAN PROVINCE.—Kaifeng, Lohyang, Chengchow, Chiaotso, Chowchiakow, Taokow, Leiho, Hsinhsiang, Changtefu, Hsinyangchow.

SHANSI PROVINCE.—Shihchiachwang, Tatungfu, Fengcheng, Yangkao.

KIANGSU PROVINCE.—Shanghai, Soochow, Wusieh, Chinkiang, Yangchow, Tsing-kiangpu, Pukow, Penpu, Hsuchow.

CHEKIANG PROVINCE.—Hangchow, Ningpo.

HUPEH PROVINCE.—Hankow, Shasi, Ichang.

KIANGSI PROVINCE.—Kiukiang.

HUNAN PROVINCE.—Changsha, Changteh, Yochow, Hengchow, Hsiangtan

SZECHUAN PROVINCE.—Chungking.

ANHWEI PROVINCE.—Wuhu, Anking, Hsuancheng, Panpu

KWANGTUNG PROVINCE.—Canton.

THREE EASTERN PROVINCES.—Yinkow, Fengtien, Changchun, Kirin, Tiehling, Sunchiatai, Liaoyang, Harbin, Chinhsien.

SPECIAL DISTRICTS.—Jehol, Kueihuacheng, Lenghsien, Chihfeng, Hsinsi, Kalgan (Chahar).

ABROAD.—Hongkong, Singapore.

THE SUMITOMO GOSHI-KAISHA

OSAKA, JAPAN

OWNERS OF BESSHI COPPER MINE, COAL MINES, SILVER AND GOLD MINES, ETC.

MANUFACTURERS OF

Tubes, Plates, Sheets and Bars of Copper, Brass, Bronze and other Alloys, Solid and Drawn Steel Tubes, Nails, Etc.—Superphosphate and Composite, Manure, Sulphuric and Nitric Acid, etc.

GENERAL WAREHOUSE AND BANKING BUSINESS

WORKS AND DEPARTMENTS

Warehouses ... ... Osaka, Kobe & Tokyo
Mining Offices ... ... Besshi, Wakamatsu, Sapporo & Ohgayu
WORKS:
Copper Works ... ... Osaka & Amagasaki
Fertilizer Works ... ... Niihama
Sales Departments ... ... Osaka, Kobe, Tokyo, Kure, Yokosuka, Hakata, Shanghai, Hankow and Tientsin

THE SUMITOMO STEEL WORKS, LTD.

OSAKA, JAPAN

President: Baron K. SUMITOMO

MANUFACTURERS OF

Steel Ingots, Steel Forgings, Steel and Iron Castings of Every Description for Railways, Shipbuilding Yards, Mines, Hydraulic Electric and Other Engineering Works, etc., etc.

THE SUMITOMO ELECTRIC & CABLE WORKS, LIMITED

OSAKA, JAPAN

President: Baron K. SUMITOMO

MANUFACTURERS OF

Copper, Brass, Bronze and Nickel Wires and Strips, Trolley Wires, Insulated Wires and Cables of Every Description for Telephone, Telegraph, Lighting, Power Transmission, etc., etc.

THE SUMITOMO BANK, LIMITED

Head Office: OSAKA, JAPAN

Cable Address: "SUMITBANK"

President: Baron K. SUMITOMO

Established March, 1912

(Successors to The SUMITOMO BANK)

Capital Subscribed ... ... Yen 70,000,000
Capital Paid-up ... ... „ 50,000,000

Reserve Fund ... ... Yen 22,500,000
Deposits ... ... „ 369,000,000

Head Office: Kitahama, Osaka
City Offices: Semba, Bingomachi, Nakanoshima, Dotonbori, Kawaguchi, Tenma, Nipponbashi.
Home Branches: Tokyo (Tokyo, Toriaburacho, Fukagawa, Shinbashi, Asakusa), Yokohama, Nagoya, Kyoto (Kyoto and Nishijin), Kobe (Kobe and Hyogo), Onomichi, Niihama, Kure, Hiroshima, Yanai, Shimonoseki, Moji, Wakamatsu, Kokura, Hakata and Kurume.

Foreign Branches: Shanghai, Hankow, Bombay, London, New York and San Francisco.

Agents: The Sumitomo Bank of Hawaii, Ltd., Honolulu, Lloyds Bank, Ltd., London, National City Bank of New York, New York.

Correspondents: In all important places at home and abroad.

The Bank buys, sells and receive for collection Drafts and Telegraphic Transfers, issues Commercial and Travellers Letters of Credit available in all important parts of the world, besides doing general Banking business.

THE

MITSUBISHI BANK,

LIMITED

CAPITAL SUBSCRIBED - Yen 50,000,000
CAPITAL PAID-UP - - - Yen 30,000,000

PRESIDENT:

Baron Koyata Iwasaki

MANAGING DIRECTORS:

Mr. Manzo Kushida   Mr. Mikitaro Kikuchi
Mr. Kiyoshi Sejimo   Mr. Takeo Kato

HEAD OFFICE:

No. 1 Yayesucho Itchome, Kojimachi-ku,
Tokyo, Japan.

BRANCH OFFICES:

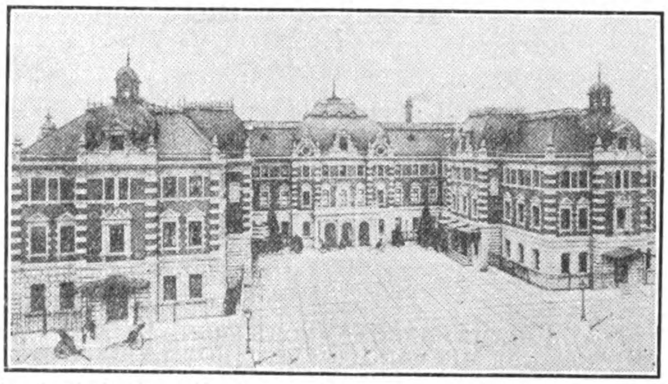
Fukagawa (Tokyo), Marunouchi (Tokyo), Nihonbashi (Tokyo), Osaka, Nakanoshima (Osaka), Kobe, Kyoto, Nagoya, Shanghai, New York and London.

General Banking and Exchange Business

Agents for Hongkong and Shanghai Banking Corporation

THE MITSUI BANK, LTD.

The Oldest Bank in Japan, Founded in 1673



Capital Subscribed... ....Y. 100,000,000.00
Capital Paid-Up.....................Y. 60,000,000.00
Reserve Fund (July 1921)......Y. 28,000,000.00

HEAD OFFICE:

No. 1 Suruga-cho, Nihonbashi-ku,
TOKYO

BOARD OF DIRECTORS:

GENYEMON MITSUI, Esq. (*President*); SEIHIN IKEDA, Esq., UMEKICHI YONEYAMA, Esq., NAOJIRO KIKUMOTO, Esq. and OTOHIKO MAJIMA, Esq. (*Managing Directors.*)

TOMITARO HARA, Esq., KANETARO KISHIMOTO, Esq., HIROKICHI KAMESHIMA, Esq. and KIKUSABURO FUKUI, Esq. (*Directors*).

Branches:

NIHONBASHI (Tokyo), OTARU, YOKOHAMA, NAGOYA, KYOTO, OSAKA, NISHI (Osaka), KAWAGUCHI (Osaka), NAKANOSHIMA (Osaka), KOBE, HIROSHIMA, SHIMONOSEKI, MOJI, WAKAMATSU, FUKUOKA, NAGASAKI, SHANGHAI.

Foreign Agents:

London: Barclays Bank, Ltd.
London Joint City & Midland Bank, Ltd.
New York: The National City Bank of New York.
The Chase National Bank.
Bankers Trust Co.
Paris: Banque de l'Union Parisienne.
Comptoir National d'Escompte de Paris.
Bombay: National Bank of India, Ltd.

THE DAI-ICHI GINKO, LTD.

(FORMERLY THE FIRST NATIONAL BANK)

ESTABLISHED 1873

Subscribed Capital	- - -	**Yen 50,000,000.00**
Paid-Up Capital	- - - -	**Yen 36,350,000.00**
Reserve Fund	- - - -	**Yen 31,500,000.00**

Y. SASAKI, *President*

K. ISHII, *Managing Director.* Y. NOGUCHI, *Managing Director.* S. SUGITA, *Managing Director.*

HEAD OFFICE:

No. 1 KABUTO-CHO, NIHONBASHI-KU, TOKYO.

T. AKASHI, *Manager*

CITY BRANCHES:

ISECHO, SHIN-OSAKACHO, FUKAGAWA, MARUNOUCHI.

HOME BRANCHES:

YOKOHAMA, NAGOYA, YOKKAICHI, KYOTO, NISHIJIN (KYOTO), GOJO (KYOTO), FUSHIMI, OSAKA, NISHIKU (OSAKA), MINAMIKU (OSAKA), HONMACHI (OSAKA), KOBE, HYOGO, HIROSHIMA, SHIMONOSEKI, CHOFU, MOJI, FUKUOKA, KURUME, KUMAMOTO, HAKODATE, OTARU, SAPPORO, MURORAN.

BRANCHES IN COREA:

SEOUL, FUSAN.

LONDON & NEW YORK BANKERS:

London: London County Westminster & Parr's Bank, Ltd.; The London Joint City & Midland Bank, Ltd.; The Yokohama Specie Bank, Ltd.

New York: The National City Bank of New York.; The National Bank of Commerce in New York.; The Yokohama Specie Bank, Ltd.

CORRESPONDENTS:

The Bank, in addition to its own Branches, has numerous Agencies or Correspondents in the principal Cities and Towns at Home and Abroad.

THE ONE HUNDREDTH BANK, LTD.

(DAI HYAKU GINKO)

HEAD OFFICE, AWOMONO-CHO, TOKYO

TOKYO BRANCHES: No. 1 Torihatagocho, Nihonbashi: No. 10, Ginza Nichome, Kyobashi
YOKOHAMA BRANCH: Nos. 53-55 Honcho Shichome
OSAKA BRANCH: 28 Bingo-machi, Nichome
KYOTO BRANCH: Shijo Higashinotoin
SHINMACHI BRANCH: Shinmachi Dori Sanchome

President: K. IKEDA, Esq.

Managing Director: S. CHOH, Esq.

SUBSCRIBED CAPITAL - - - -	Yen 25,000,000
CAPITAL PAID-UP - - - - -	Yen 17,500,000
RESERVE FUND - - - - -	Yen 8,094,340
DEPOSITS - - - - - - - -	Yen 110,740,264

Transacts General Banking and Foreign Exchange Business. Conducts Trust Company Business

Hongkong and Shanghai Banking Corporation

Paid-up Capital	... ...	$20,000,000
Reserve Funds: Sterling	... ...	£4,500,000
Silver	... ...	$23,500,000
Reserve Liability of Proprietors	... ...	$20,000,000

Court of Directors:

G. M. DODWELL, Esq., Chairman
Hon. Mr. A. O. LANG, Deputy Chairman
D. G. M. BERNARD, Esq.
G. T. M. EDKINS, Esq.
P. H. HOLYOAK, Esq.
Hon. Mr. E. V. D. PARR
W. L. PATTENDEN, Esq.
J. A. PLUMMER, Esq.
A. M. BOWES SMITH, Esq.
H. P. WHITE, Esq.

Head Office:
HONGKONG

Chief Manager:
HONGKONG . . . Hon. Mr. A. G. STEPHEN

London Bankers:
LONDON COUNTY WESTMINSTER AND PARR'S BANK LTD.

Shanghai Branch: 12 The Bund
Sub-Agency: 9 Broadway

Branches and Agencies:

AMOY	LONDON
BANGKOK	LYONS
BATAVIA	MALACCA
BOMBAY	MANILA
CALCUTTA	NAGASAKI
CANTON	NEW YORK
CHEFOO	PEKING
COLOMBO	PENANG
DAIREN	RANGOON
FOOCHOW	SAIGON
HAIPHONG	S. FRANCISCO
HAMBURG	SHANGHAI
HANKOW	SINGAPORE
HARBIN	SOURABAYA
ILOILO	SUNGEI PATANI
IPOH	TIENTSIN
JOHORE	TSINGTAO
KOBE	VLADIVOSTOCK
KUALA LUMPUR	YOKOHAMA

Interest allowed on Current Accounts and on Fixed Deposits according to arrangement.

Local Bills Discounted. Credits granted on approved Securities and every description of Banking and Exchange business transacted Drafts granted on London and the chief commercial places in Europe, India, Australia, Africa, China, Japan and America.

G. H. STITT, *Manager.*

SOUTH AMERICA

We offer a complete banking service in the following countries, special attention being given to the handling of collections.

HEAD OFFICE: MONTREAL, CANADA

ARGENTINE	BRAZIL	URUGUAY
Buenos Aires (2 Branches).	Rio de Janeiro, Santos, Sao Paulo.	Montevideo.
VENEZUELA	**COLOMBIA**	**BR. GUIANA**
Caracas, Ciudad Bolivar. Maracaibo.	Barranquilla.	Georgetown, Rose Hall, New Amsterdam.

Also 90 Branches in
CUBA, PORTO RICO, DOMINICAN REPUBLIC, HAITI, COSTA RICA, BR. HONDURAS, BRITISH WEST INDIES and FRENCH WEST INDIES

614 Branches throughout CANADA & NEWFOUNDLAND

LONDON	PARIS	NEW YORK	BARCELONA
Princes St., E.C.	28, Rue du Quatre-Septembre.	68, William St.	Plaza de Cataluna 6.

THE ROYAL BANK OF CANADA

CAPITAL PAID UP & RESERVES $41,000,000 GOLD
TOTAL RESOURCES - - $500,000,000 GOLD

DIVING APPARATUS

OF ALL PATTERNS IN USE TO-DAY

Contactors to . . .
BRITISH ADMIRALTY
WAR OFFICE,
INDIA OFFICE,
TRINITY HOUSE, etc.

Prompt shipment of complete sets and accessories of every description

Immediate Delivery

ALSO MAKERS OF

SMOKE HELMETS for Steamships, Oil Tankers, Oil Companies, Chemical Works, etc.
OXYGEN BREATHING APPARATUS For Rescue Work in Mines
MEDICAL OXYGEN APPARATUS for Resuscitation purposes
Oxygen Supplies of every description
Air Compressors Vacuum Pumps

SIEBE, GORMAN & CO., LTD.
187 WESTMINSTER BRIDGE ROAD,
LONDON, ENGLAND

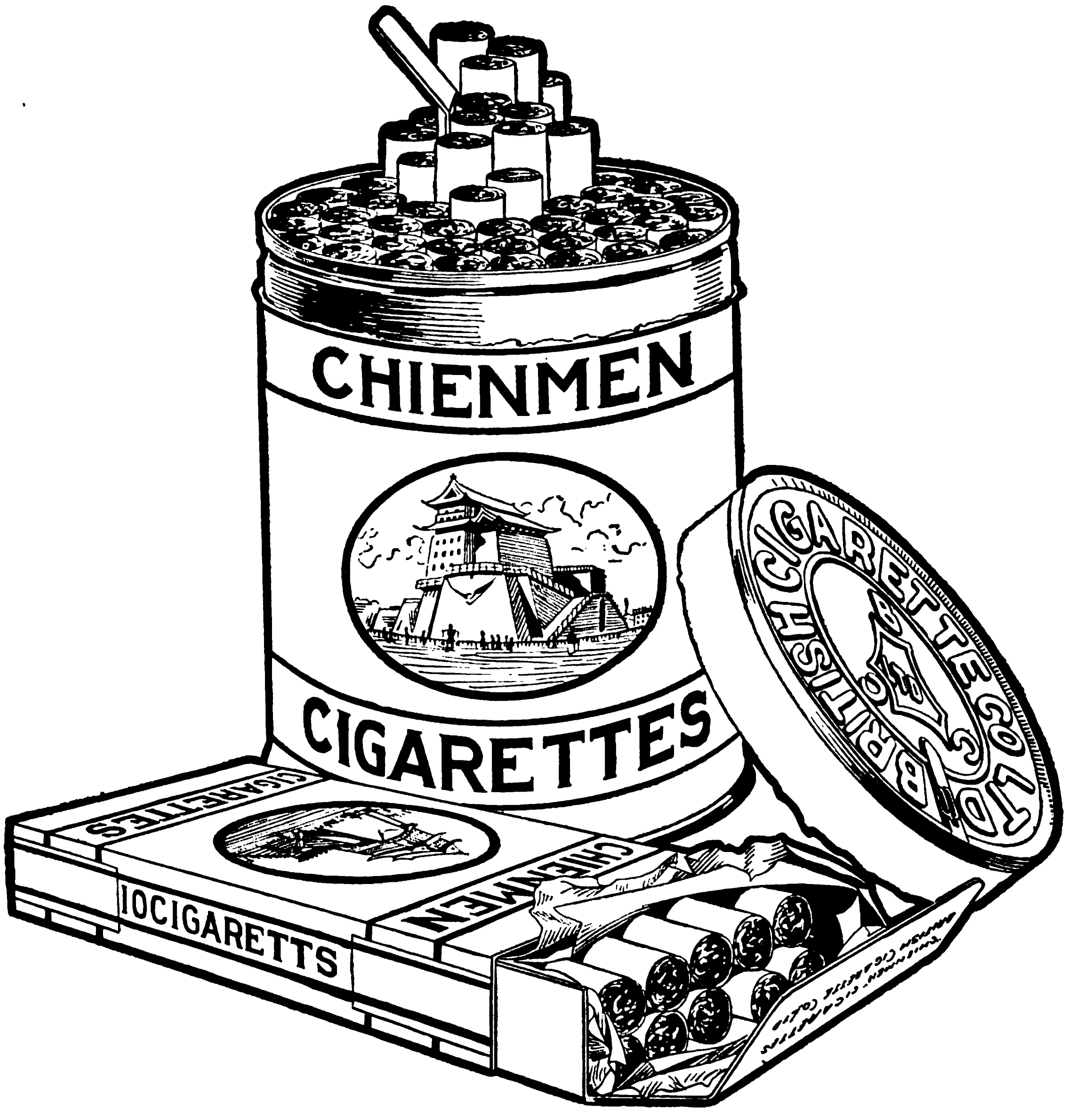
Agents for Japan and South China: MITSUI BUSSAN KAISHA

Cables: "SIEBE, LONDON."

Codes used: A.1, A.B.C. (5th Edition), Western Union, Engineering & Private

CHIENMEN

Cigarettes



A brand well known to the "High Grade Cigarette Smoking Public" of China.

BRITISH-AMERICAN TOBACCO CO. (CHINA), LTD.

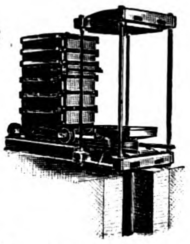
Distributors

Tel. Address: "OMO" | Codes: A.B.C. 4th & 5th Edition | Established 1810

To Exporters and Manufacturers

who require

Hydraulic Presses



Hydraulic Packing Press, for Cotton Waste, etc.

for packing goods of every description, for Home and Foreign transport.

May we have your enquiries?

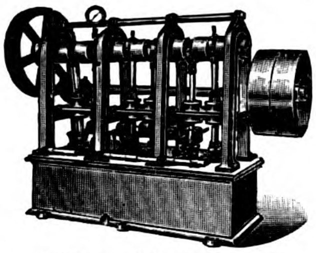
We make Presses and Pumps for Hand, Steam, and Electric Power.

EDWIN MILLS & SON LTD.

Wakefield Road,

Aspley,

HUDDERSFIELD.



6 Throw Belt Driver Pump

Hydraulic Leathers, Pipes and Fittings always in stock.

DEUTSCHES

BAKTERIOLOG. SEROLOG. INSTITUT

G. M. B. H., SHANGHAI

ANALYTICAL TESTS

BY LATEST GERMAN METHODS OF

BLOOD, for Lues, Anæmia, Malarial and other Blood Parasites, etc.

URINE, for Various Diseases.

FECES, for Amœbic and Bacillary Dysentery, Typhus, Parasites, Blood, etc.

SPUTUM, for Tuberculosis, etc.

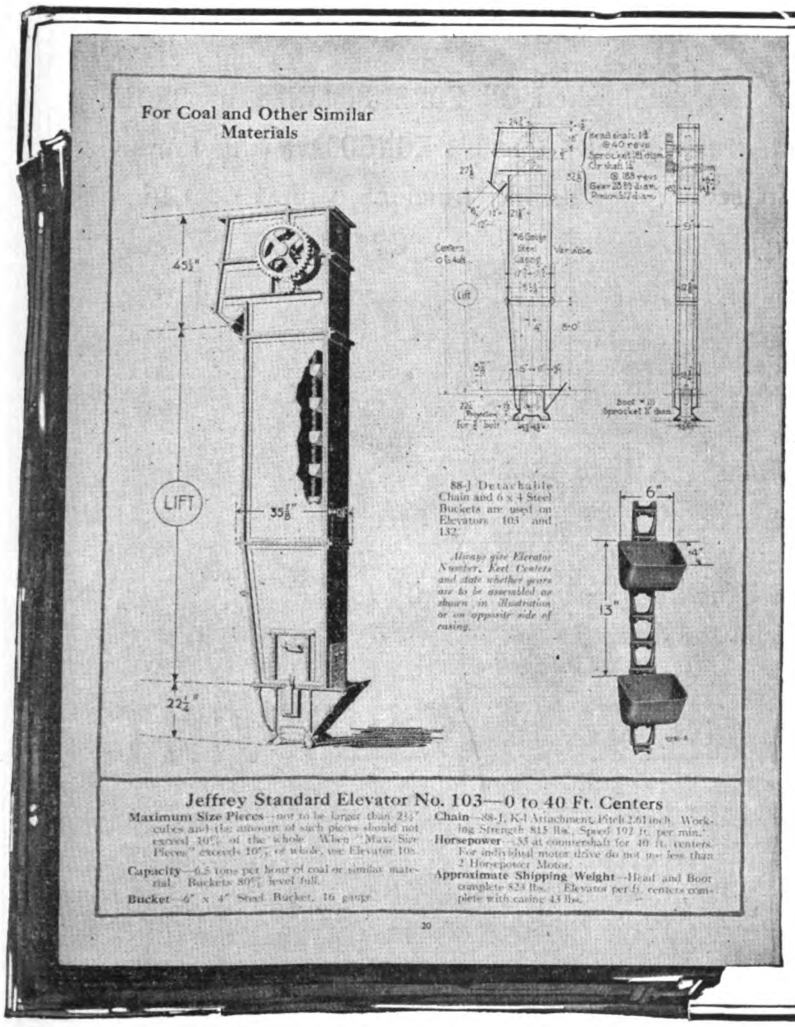
FILMS, for Gonorrhœa, etc.

WASSERMANN-REACTION twice a week.

Details and terms upon application.

Consulting Rooms and Laboratories:
16 CANTON ROAD, 2nd Floor

Consulting hours: 10 a.m.—12 noon; 5—7 p.m. Tel. C. 7031



A Typical Page from the New 85 Page Catalog on

Jeffrey Standard Elevators

for handling Coal, Ashes, Sand, Gravel, Stone and other similar loose materials.

YOU can easily select a Jeffrey Standard Bucket Elevator to meet your requirements, from the 56 pages devoted to details on Elevators, which are illustrated both in perspective and in line drawings giving dimensions, chains and buckets, etc. At the bottom of each sheet is given a full list of all specifications applying to that particular elevator.

Write for copy of Catalog 244 on Jeffrey Standard Bucket Elevators

The Jeffrey Mfg. Co., Columbus, O., U.S.A.

JEFFREY
MATERIAL HANDLING MACHINERY

SOUTH MANCHURIA RAILWAY

MANCHURIA AND CHOSEN LINES

Circular and Overland Trips at Greatly Reduced Rates

TOURIST TRAVEL OFF THE BEATEN TRACK

Tourists in the Far East should not miss Manchuria. Through Japan, Chosen (Korea), and Manchuria (or vice versâ) is an ideal trip, combining the distinctive characteristics of three unique and profoundly interesting countries.

THE CHOSEN AND MANCHURIA LINES are under the management of the South Manchuria Railway Company. Express trains have been temporarily suspended (except between Fusan and Seoul and Dairen and Changchun), but the **ORDINARY TRAINS ARE EQUAL TO MOST AMERICAN TRAINS,** run at least twice a day from each end, and to some of them Sleeping and Dining Cars are attached. Sleeping berths should be reserved in advance.

HOTELS under the Company's management are established **ON FOREIGN LINES** at **SEOUL** (capital of Chosen), **FUSAN** and **SHINGISHU** (the two extremities of Chosen), **KONGOSAN** (the famous Diamond Mountain of Korea, rivalling Switzerland in scenery), **MUKDEN** (ancient capital of China, home of the Manchuria Dynasty, noted for Imperial Palaces and Tombs), **CHANGCHUN** (junction for three railways and "key to Manchuria"), **PORT ARTHUR** (of world-wide fame for its historic sieges and ruined forts), **DAIREN** (one of the greatest commercial cities in the Orient), and **HOSHIGAURA** (the finest seaside resort in North China).

FROM DAIREN there are **FREQUENT AND REGULAR STEAMERS** to and from Shanghai, Tsingtao, Tientsin, etc.

For pictorial guide-books, pamphlets, and further particulars, apply to the Tourist and Ticket Agencies, or direct to the

SOUTH MANCHURIA RAILWAY COMPANY

Head Office: DAIREN

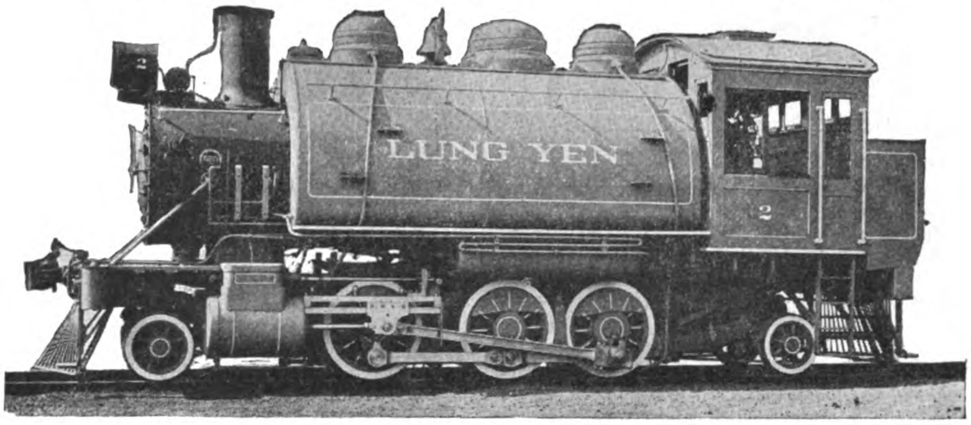
Branch Offices: TOKYO, SEOUL, HARBIN, KIRIN, PEKING, SHANGHAI AND NEW YORK.

Telegraphic Address: MANTETSU or SMRCO. Codes: A.B.C. 5th & 6th Editions, A1 Lieber's, and Bentley's

BALDWIN

Adequate Motive Power
For Mining Service in China

Baldwin Six-Coupled Double Ender Locomotives Meet the Most Exacting Requirements in Switching and General Utility Work



BALDWIN 2-6-2 TYPE LOCOMOTIVE BUILT FOR THE LUNG YEN MINING ADMINISTRATION

Gauge, 4 feet 8½ inches. Cylinders 18 by 24 inches. Working pressure, 175 pounds. Fuel, soft coal. Driving wheels, diameter, 44 inches. Wheel base 9 feet. Weight, 148,500 pounds. Tractive force at 85% of boiler pressure, 26,300 pounds. Service, shunting.

巴爾威

WITH the rapid development in mining operations in China, the Baldwin double-ender locomotive, as illustrated, has been found very serviceable.

The short, rigid wheel base, combined with the guiding and supporting features of front and rear trucks makes this type of locomotive safe to operate in either direction on light rails and over short radius curves.

Our representatives will furnish any information regarding Baldwin industrial locomotives, or we will contract to build to any individual specifications. We invite correspondence regarding any feature of motive power transportation.

THE BALDWIN LOCOMOTIVE WORKS

PHILADELPHIA, U.S.A. **Cable Address : "Baldwin, Philadelphia"**

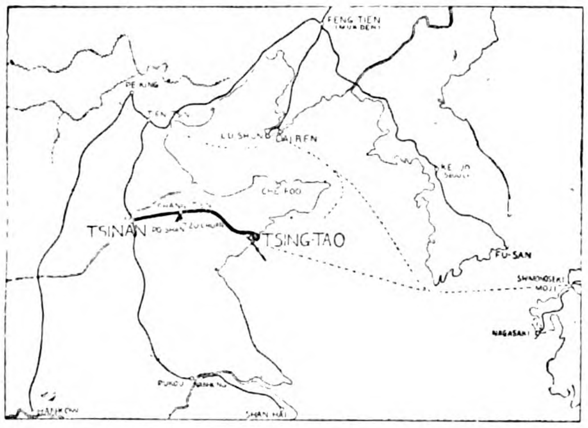
SALE & FRAZAR, LTD., Tokyo and New York
J. O. FEENSTRA, Bandoeng, Java, D. E. I.
C. BREWER & CO., LTD., Honolulu, Hawaii
NEWELL & CO., Melbourne, Victoria
ANDERSEN, MEYER & CO., LTD., Shanghai and New York
PHILLIPS & PIKE, Wellington, New Zealand
R. TOWNS & CO., Sydney, New South Wales
LESLIE & CO., Perth, Western Australia
PACIFIC COMMERCIAL CO., Manila, P. I., and New York
J. W. KELER, Harbin, Manchuria

699

LOCOMOTIVES

SHANTUNG RAILWAY

The Shortest Route between Japan and North China



THROUGH TRAFFIC

Through passenger tickets are issued between the following principal stations of the Shantung Railway: Kiaochow, Kaomi, Fangtsu, Weihsien, Chingchow, Changtien, Choustun, Tsinan, Tzuchuan, Poshan, and the following points: In Manchuria—Port Arthur, Newchwang, Liaoyang, Fushun, Mukden, Tiehling, Kaiyuan, Changchun, Penchihu, Antung, and Dairen; in Japan—Tokyo, Yokohama, Nagoya, Kyoto, Osaka, Kobe, Ujina, Moji, Shimonoseki, Nagasaki and Shanghai.

Steamer Connections—Steamers leave the wharves of the Large Harbour, Tsingtao, for Moji and Kobe every five days, for Shanghai about twice a week and for Dairen about three times a week.

For giving facilities to through passengers for Japan, a special train in connection with the night train No. 4 is operated from the Harbour Station to the Wharf, direct alongside the ship, on those days when the liners of the Nippon Yusen Kaisha, Osaka Shosen Kaisha, and Harada S.S. Co. are leaving.

Through passengers and their luggage are carried free of charge for this section.

Collieries—The Tzuchuan (Shisen) and Fangtzu (Boshi) Collieries are managed by the Mining Department of the Shantung Railway. At present the daily output of Tzuchuan coal is about 1,500 tons, far surpassing the amount taken out when the Germans were in control. The coal is well-known for its good quality and fair price.

Tsinan—Tsinan, the capital of Shantung, is the western terminus of the Shantung Railway, and also one of the most important stations on the Tientsin-Pukow Railway.

The Tsinan Railway Hotel, furnished in modern European style, is found on the upper floor of the Tsinan Station, under the control of the Shantung Railway Administration.

THROUGH TRAIN SERVICE

Train No. 1 leaves Tsingtao daily 10.00 p.m. arrives Tsinan 8.00 a.m.
Train No. 3 leaves Tsingtao daily 8.00 a.m. arrives Tsinan 6.40 p.m.
Train No. 2 leaves Tsinan daily 11.00 p.m. arrives Tsingtao 8.35 a.m.
Train No. 4 leaves Tsinan daily 10.10 a.m. arrives Tsingtao 8.20 p.m.

Local Trains run between Tsingtao and Kaomi, Weihsien and between Fangtzu and Tsinan, and on the Poshan and Tzuchuan colliery branches.

Fares—Tsingtao-Tsinan—1st class, $14.30 ; 2nd class, $7.20.

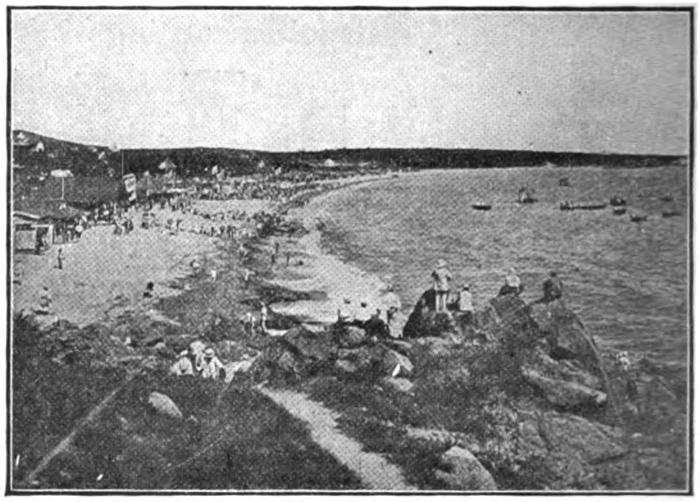
First Class Sleeping Car—A first-class sleeping car is attached to night trains Nos. 3 and 4 running between Tsingtao and Tsinan. For a berth in the sleeping car in S.Y. 3.00 for the lower berth and S.Y. 2.00 for the upper berth is charged in addition to the ordinary first-class fare, irrespective of distance.

Dining Car—A dining car is attached to through trains Nos. 1, 2, 3 and 4 running between Tsingtao and Tsinan. Meals are served to order at any time.

Ticket Agencies—Messrs. Thos. Cook & Son and their branch offices in various parts of the world. The Japan Tourist Bureau in Tokyo and their Agents in Yokohama, Kobe, Nagasaki and Peking.

Connections at Tsingtao—By steamer with Japan, Manchuria and Shanghai.

Connections at Tsinan—By Tientsin-Pukow Line with Tientsin, 6.00 & 9.38 a.m. daily, and with Pukow, 7.44 a.m. & 10.21 p.m. daily.



BATHING BEACH, TSINGTAO.

Description of Tsingtao

Tsingtao is considered the most healthful place in all the Far East. The scenery including both mountains and sea, is most beautiful. There are quite extensive forest gardens, bits of woodland here and there, and many delightful shady lanes affording most interesting walks through them.

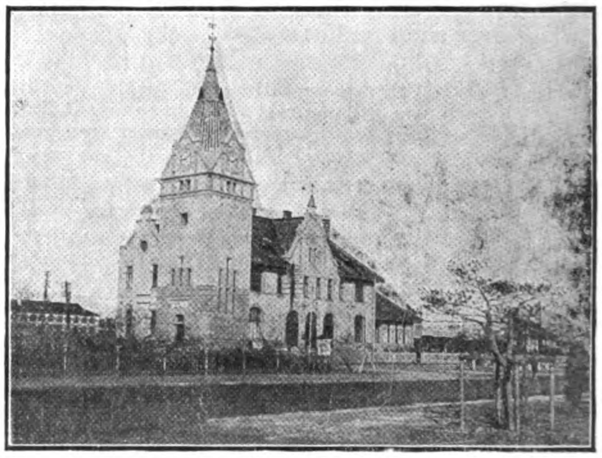
The roads are all broad, with very moderate gradients. They are of both macadamized and asphalt construction for vehicle traffic, while the sidewalks are either paved or concrete. These streets are practically all lined with beautiful shade trees.

The buildings are constructed principally in modern European style, with red tiles and white walls, contrasting pleasantly with the surrounding green mountains and blue sea.

The climate here is fine from Spring to Autumn, being neither too hot nor too cold. These climatic conditions make the place a favourite summer resort for Europeans and Americans from Shanghai, Tientsin, and other places.

The hotels are luxuriously furnished with up-to-date equipment and are under the efficient management of Mr. H. J. Hearne.

The hotel rates are $6.00 and up, per day, on the American plan.



TSINGTAU STATION

For Further Information, please apply to

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CABLE ADDRESS: "SANTETSU" CODES: A.B.C. 5TH ED. & AI.

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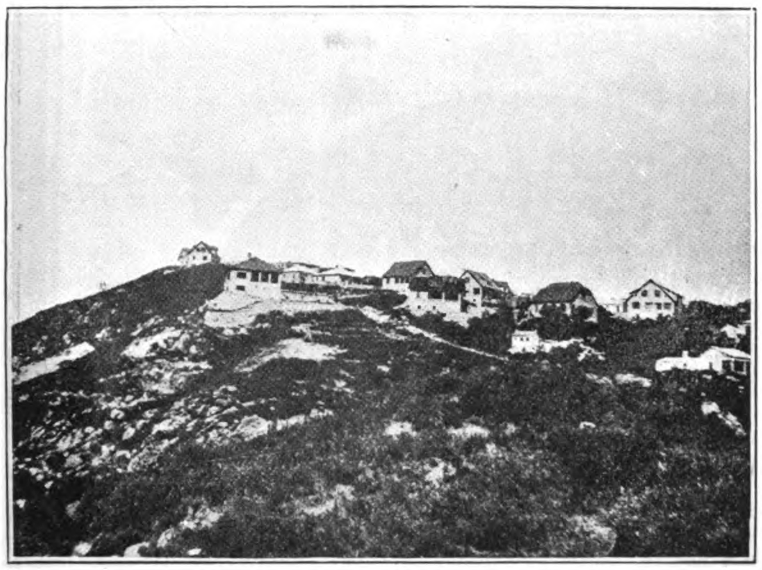
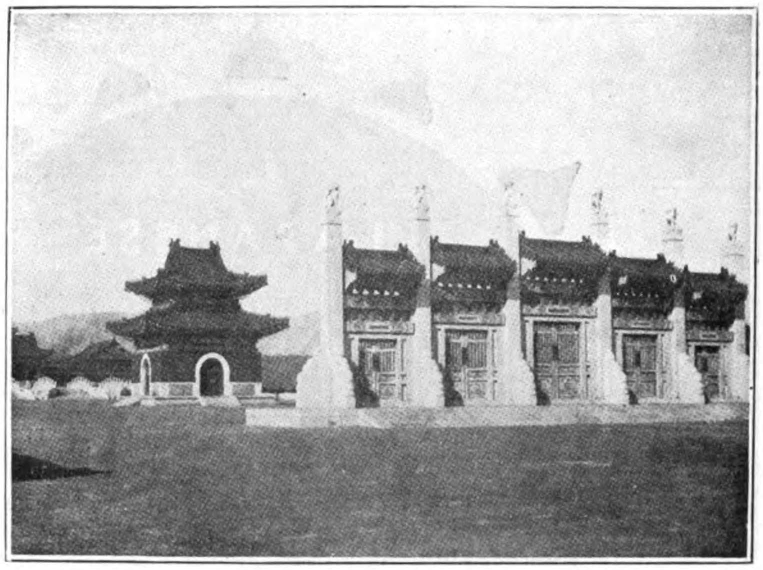


SUMMER RESORT AT CHI KUNG SHAN



AT THE CHUNG LING TOMBS

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THE Peking-Hankow Line, the most important section of China's overland route, enables tourists and travellers to get a glimpse of Old China, the train passing through magnificent scenery, traversing the great plains of Chihli, the central portion of Honan and the mountainous regions of the eastern Hupeh province.

The Peking-Hankow route joins at Fengtai the main line of the Peking-Mukden Railway, by means of which this line is connected with the railways in Manchuria, Korea, Japan, and Siberia, while steamer facilities at Hankow bring it into easy communications with the Yangtze River ports and Shanghai.

From the Capital to Hankow the journey occupies 34 hours, by the daily through train which is provided with up-to-date sleeping and dining accommodations.

In the future, this line will connect by means of a ferry-boat the Hankow-Canton Railway whose completion will bring the Capital of China, and Hankow, the Great Central Market, within easy distance of Canton the southeastern metropolie.

From the Capital to Hankow the journey about 30 hours by the bi-weekly "Express" through train which is provided with up-to-date sleeping and dining accommodations.

Chikungshan Mountain (Summer Resort).—Not many Summer Resorts in China inland, can bear comparison with the natural charming views, that reward those who ascend the mountain of Chikungshan, whose summit stands at an altitude of 1,980 ft. On reaching Sintien station, situated 110 miles from Hankow, a serpentine road climbs the mountain, on top of which are hundreds of beautiful bungalows awaiting vacationists. This popular resort is celebrated for its scenery, where an almost unbroken communion with nature can be enjoyed for a week at a time.

Hsi-ling or Western Imperial Tombs.—With their present-day accessibility, there is now little excuse for visitors to Peking omitting a trip to the Western Imperial Tombs, undoubtedly one of the most impressive sights in China. The site of these beautifully adorned Imperial Tombs is close to Liang Ko Chwang station, 79 miles from Peking, which is reached by a Branch-line, formerly built for the exclusive use of the Imperial Sovereigns when visiting the Tombs of their ancestors. The Western Tombs include the mausoleums of four Manchu Emperors and three Empresses, as well as those of a number of Princesses. The region, as a well laid-out park, closely wooded, is justly appreciated for the charming scenery surrounding the Imperial Tombs and is highly recommended to any one in search of the extraordinary and beautiful.

For Particulars, Pamphlets, Reservations, Tickets, etc., apply to the "Information Bureau" at Peking Head Office or to Tourist Agencies.

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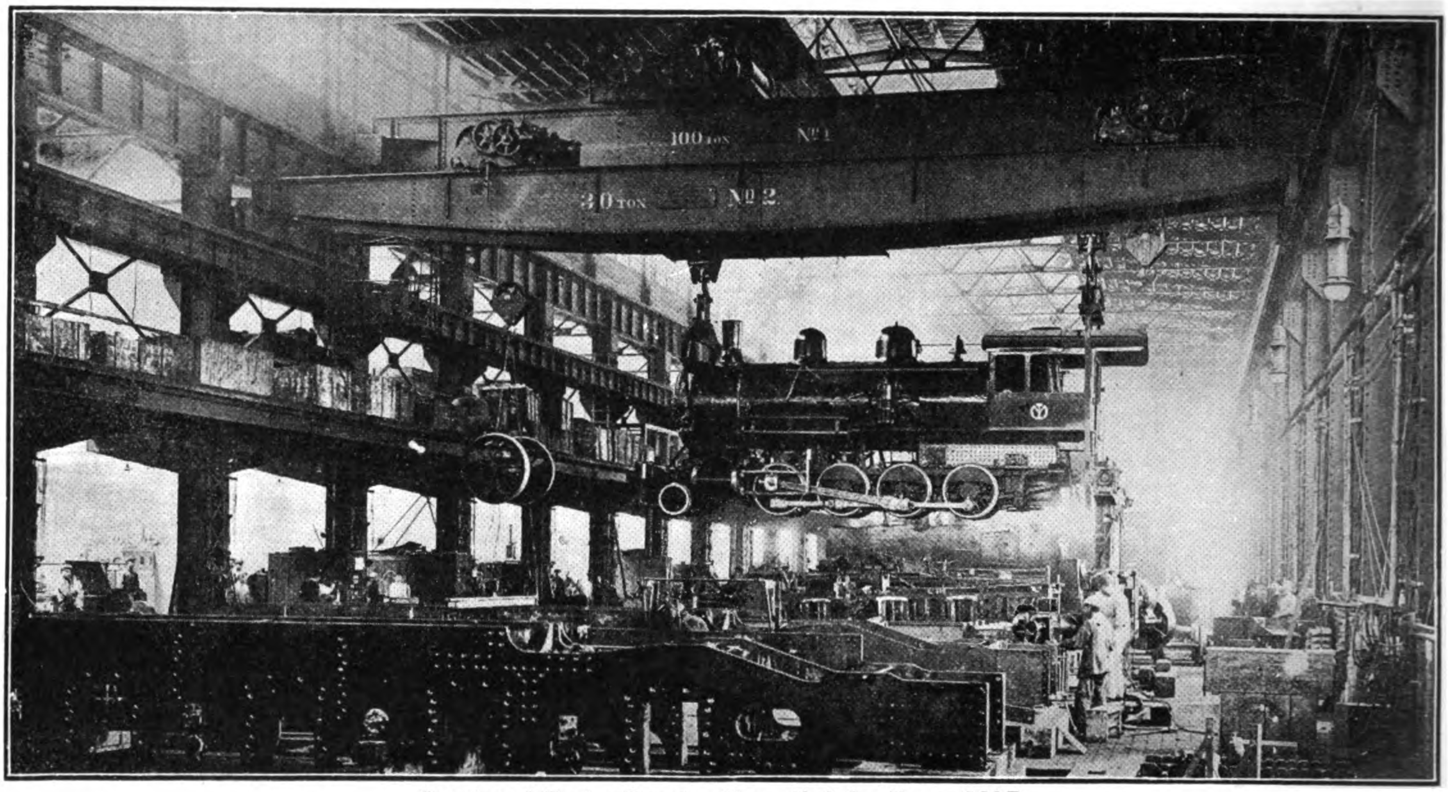

Interior of Engine Erecting Shop, Shakako Shops, S.M.R.

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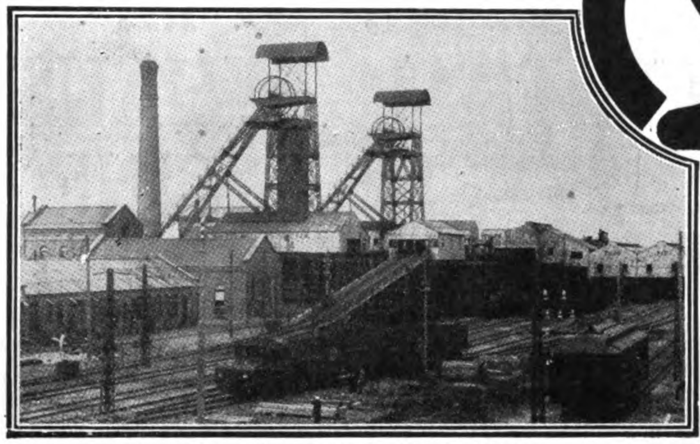
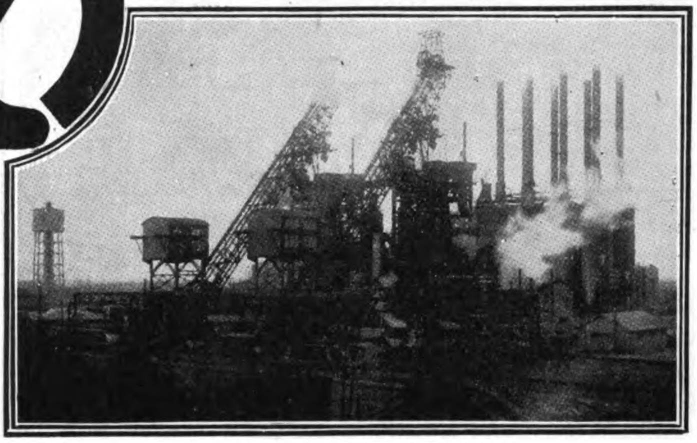


Togo Pit of the S.M.R. Fushun Collieries



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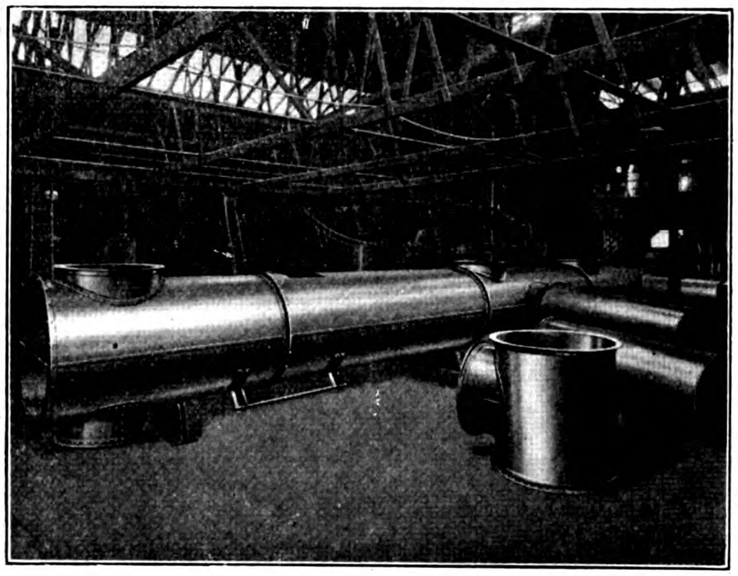

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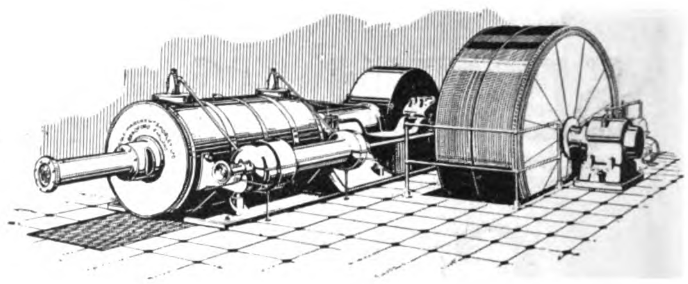

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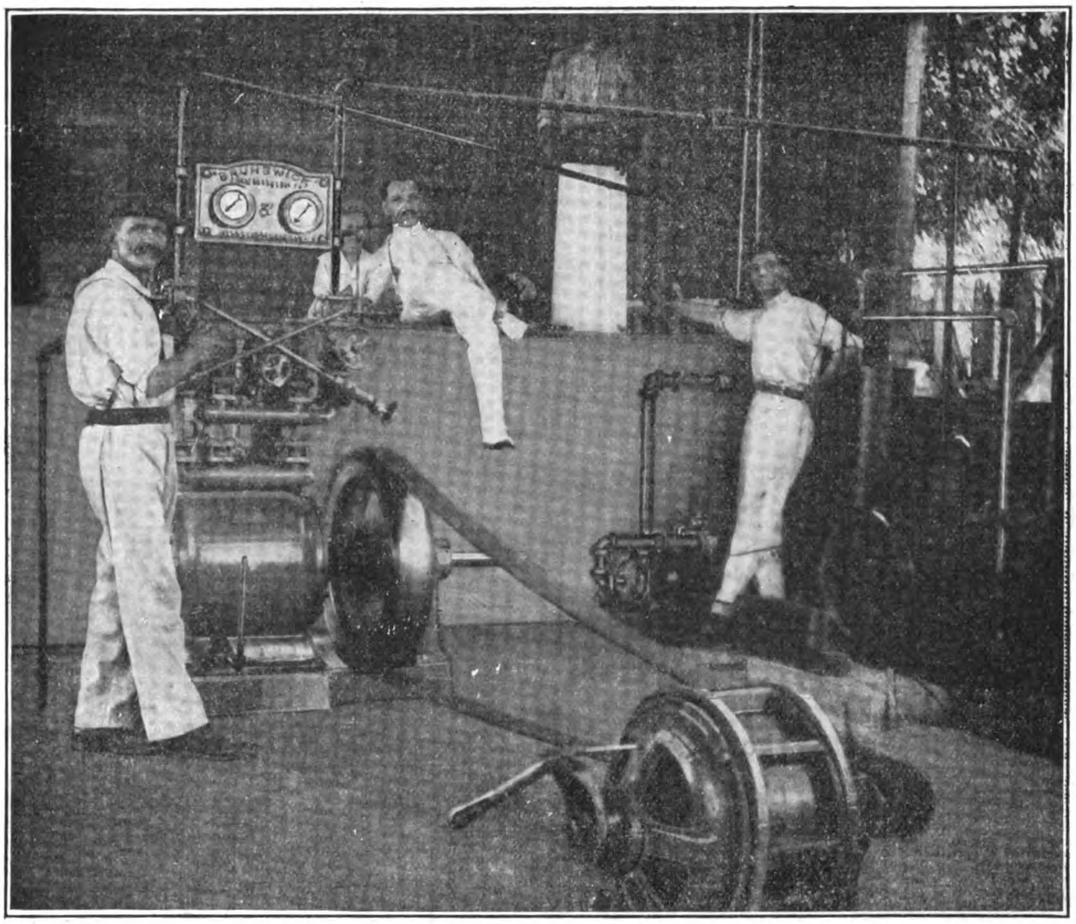

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We show here a Brunswick installation in the ice-making plant of Juan B. del Giudice of San Pedro de Macoris, D. R. The cut illustrates clearly both the simplicity and efficiency of the Brunswick equipment, its rugged construction and its ease of operation. This machine was installed in 1914, has been in constant operation ever since and has given such satisfaction that a second similar machine has lately been installed. Attention is directed to the perfection of the cake of ice just drawn from the can.

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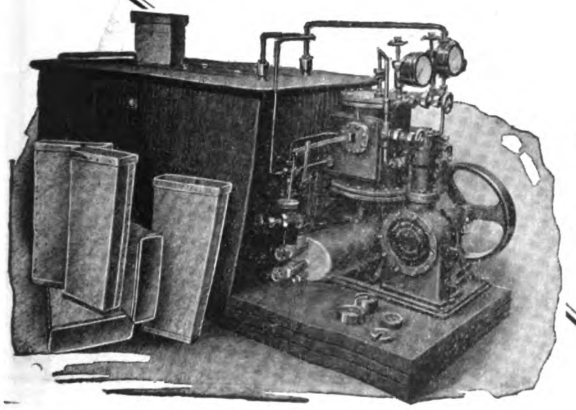

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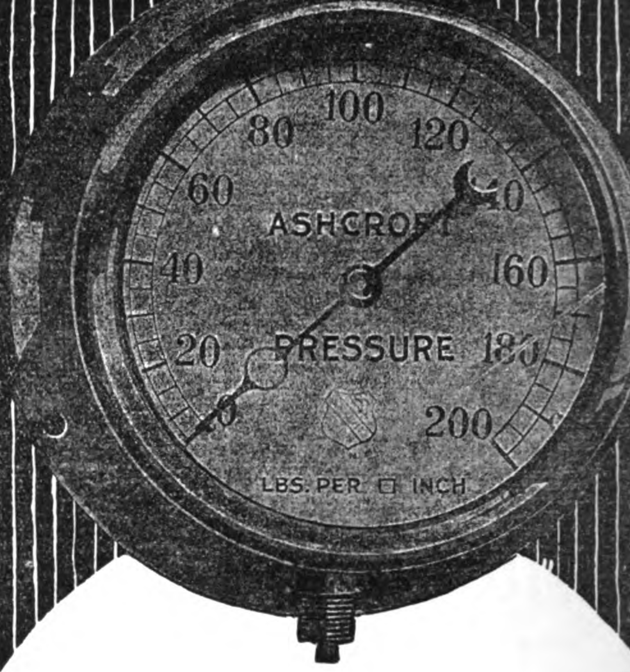

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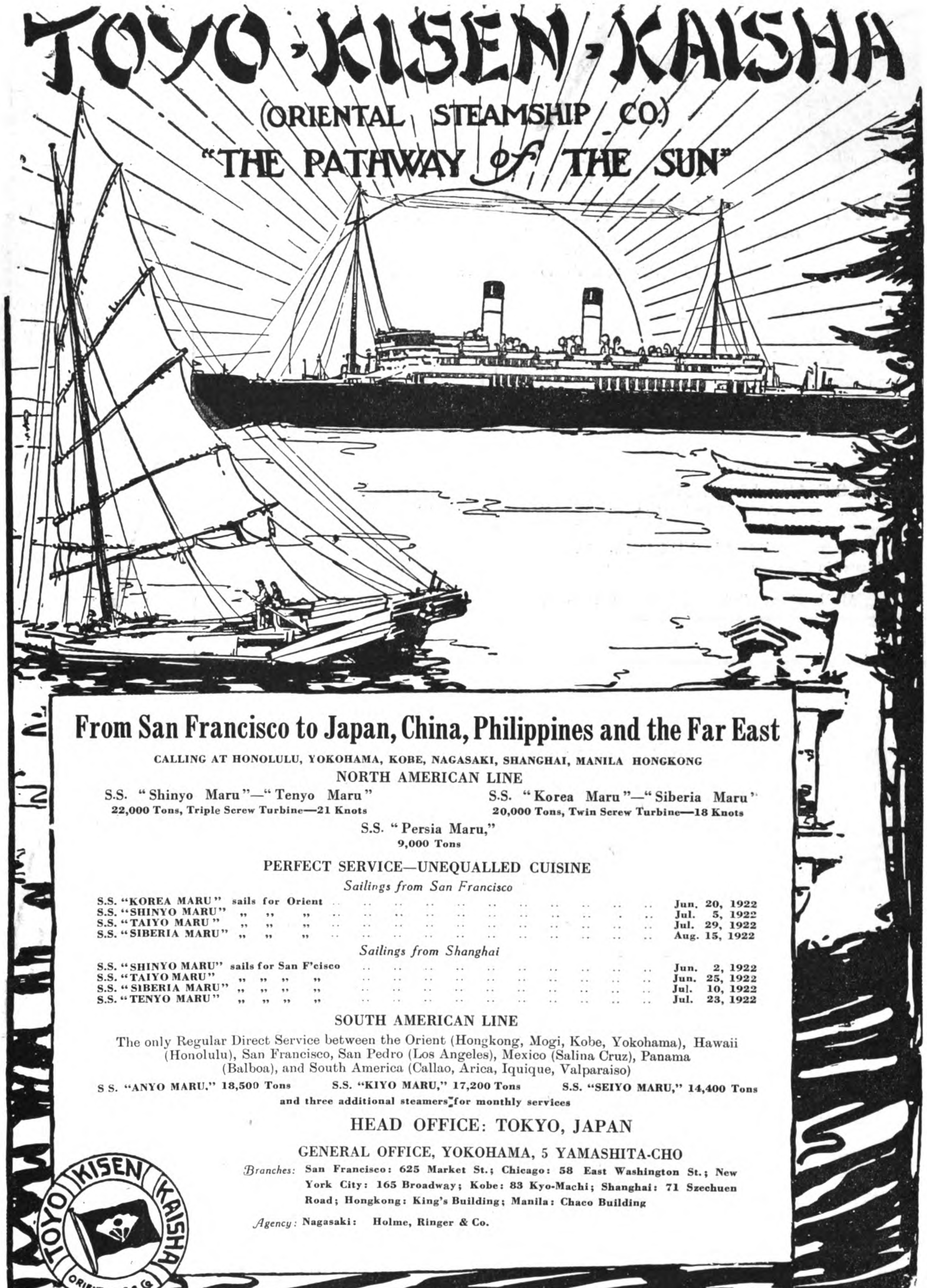

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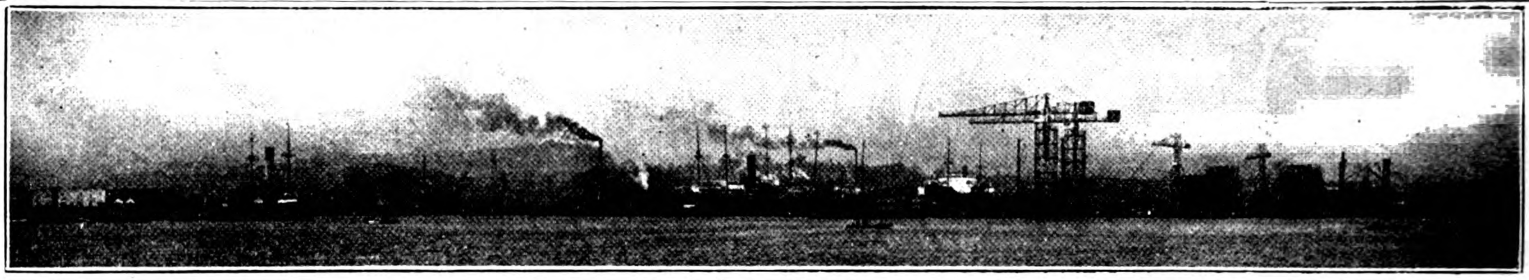

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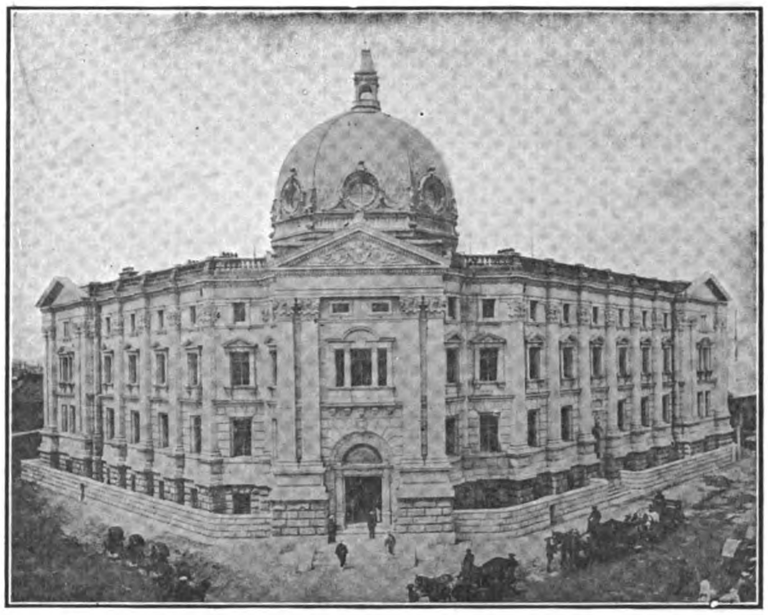

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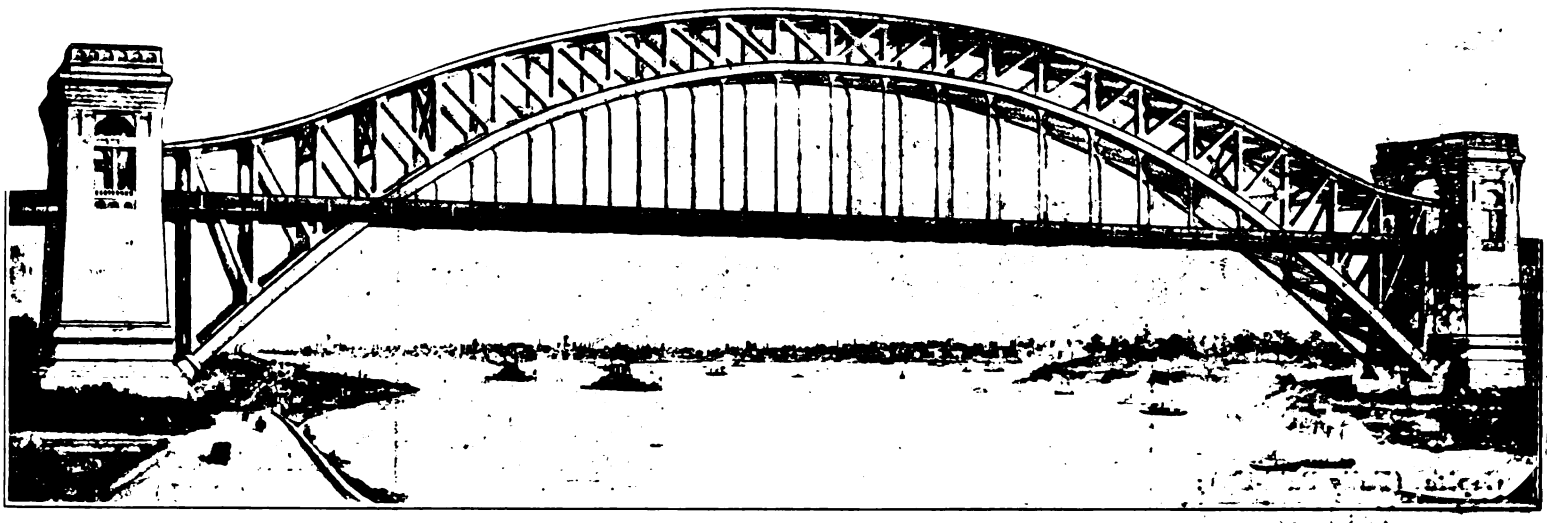

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THE FAR EASTERN REVIEW

ENGINEERING FINANCE COMMERCE

上海仁記路第五號

遠東時報

WATCH NORTHCLIFFE

JAPAN'S FLOUR MILLS

DAIREN HARBOR

ANSHAN IRON MINES

N.E.I. RAILWAY SHOPS

IRRIGATION IN SIAM

GREAT CHINA COTTON MILL

JAPAN'S ELECTRICAL DEVELOPMENT

CHINESE EASTERN RAILWAY

Vol. XVIII JUNE, 1922 No. 6

SHANGHAI, PEKING, TOKYO AND MANILA

A. L. TAYLER

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DENNIS

COMMERCIAL MOTORS

Practically back to Pre-War Prices

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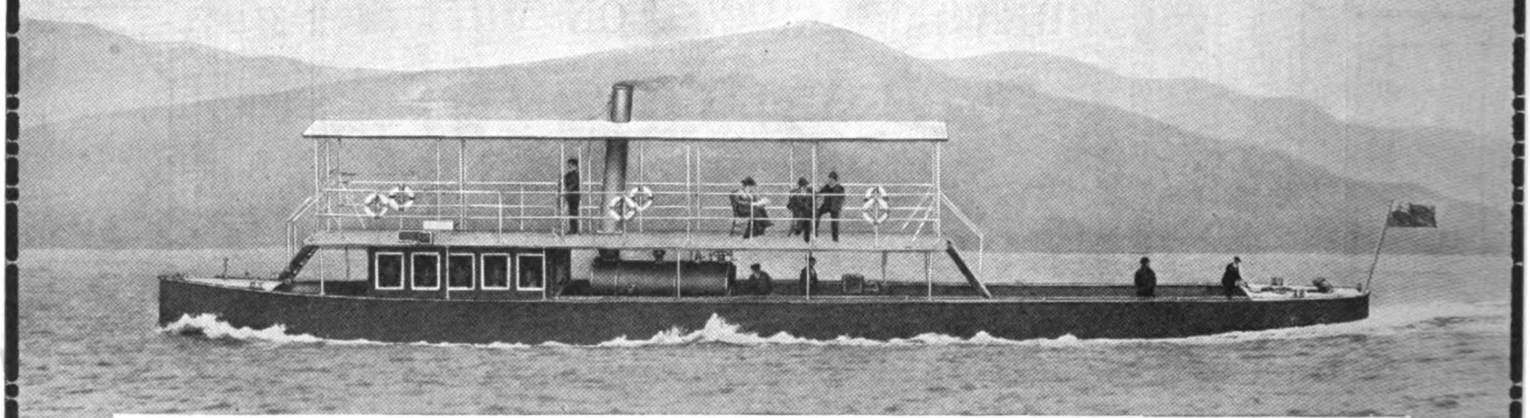

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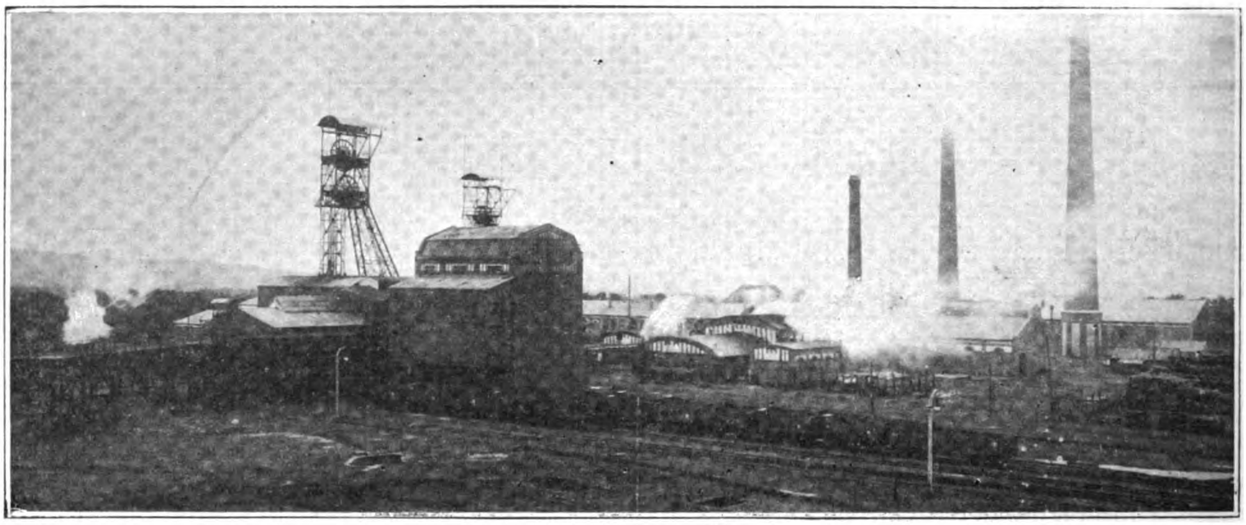

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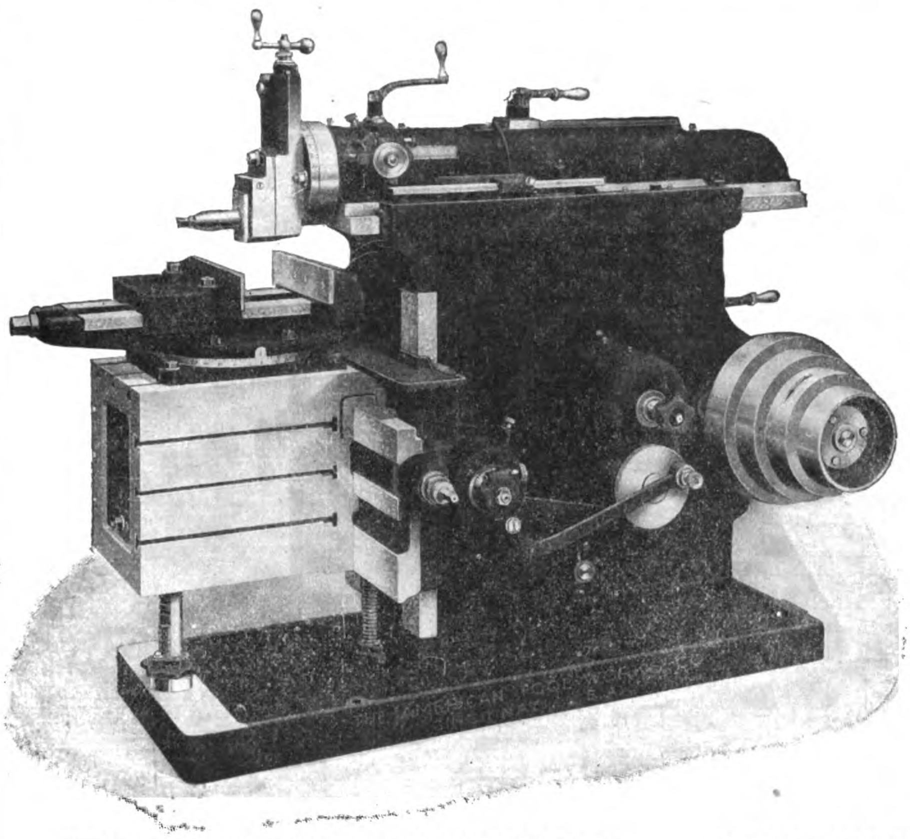

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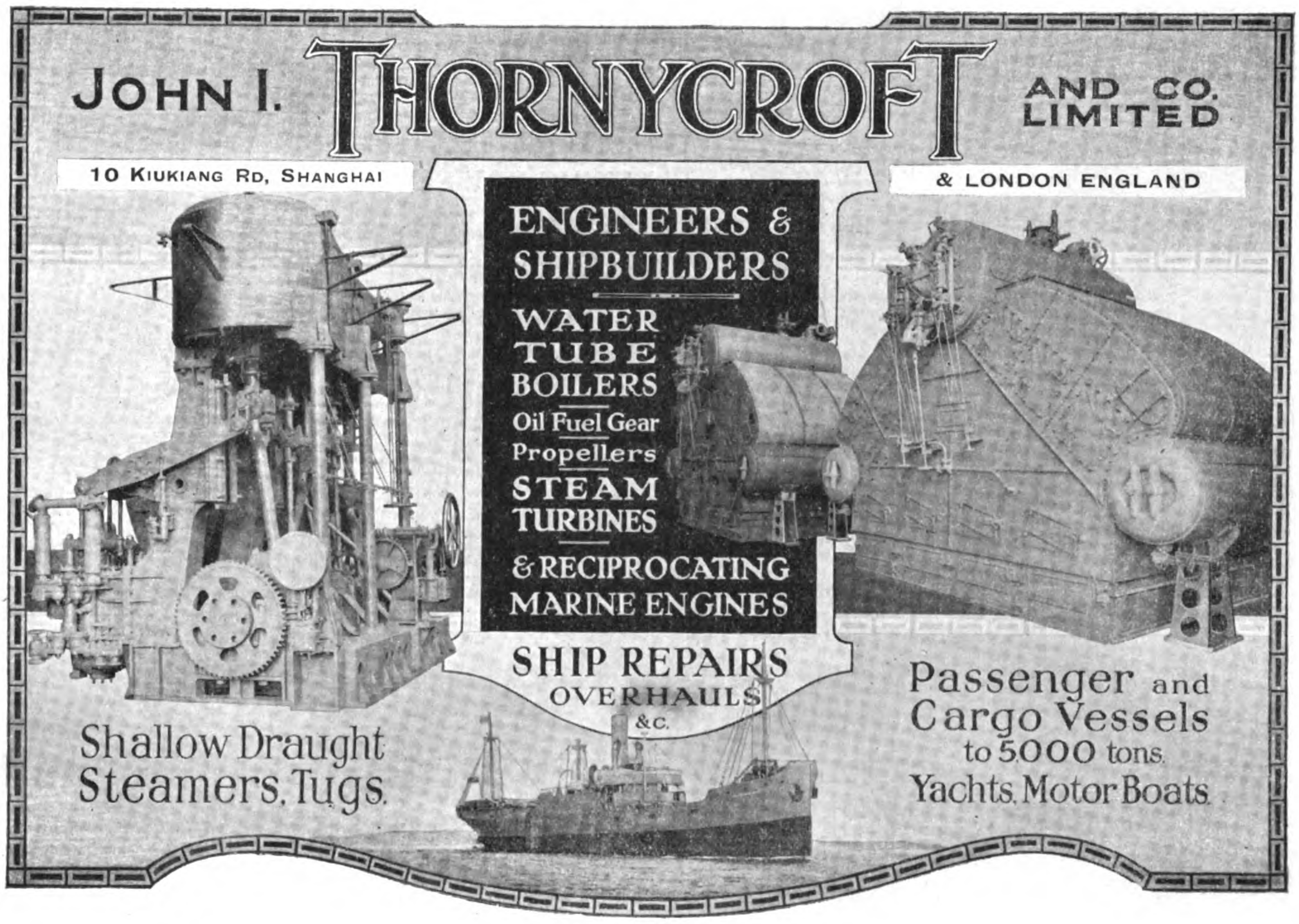

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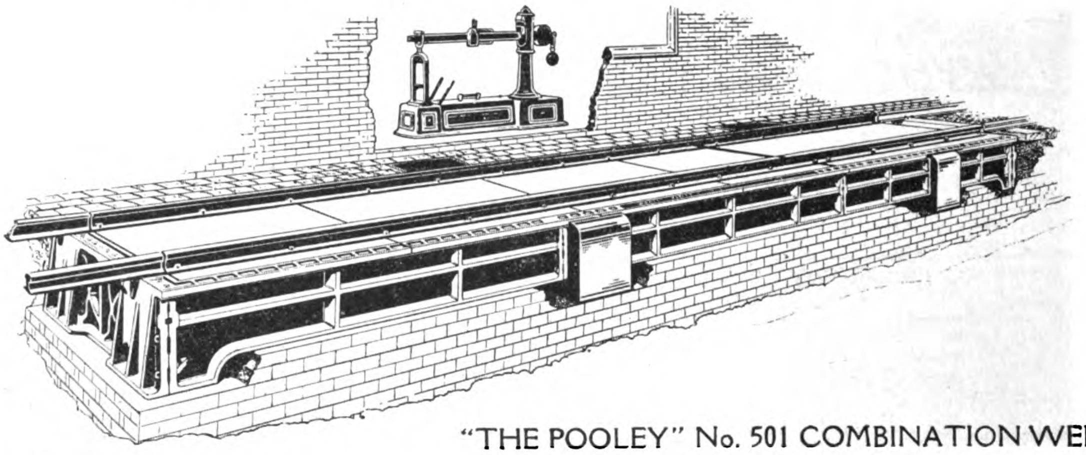

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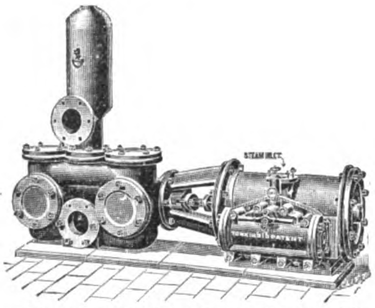

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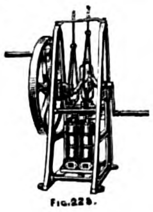
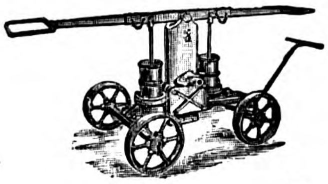
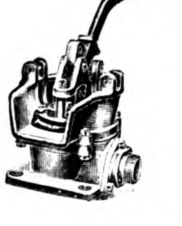


FIG.228.

FIG.160.





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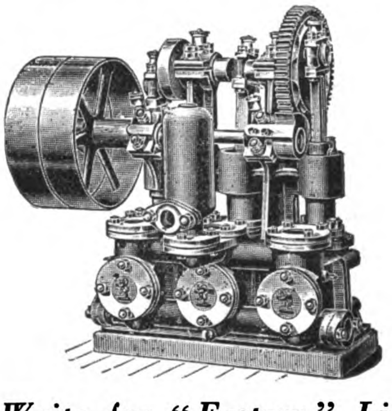

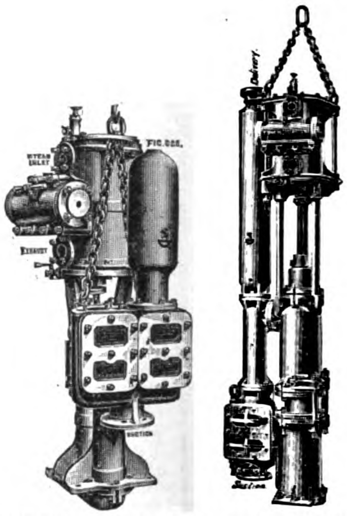

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FIG.191.

FIG.185.

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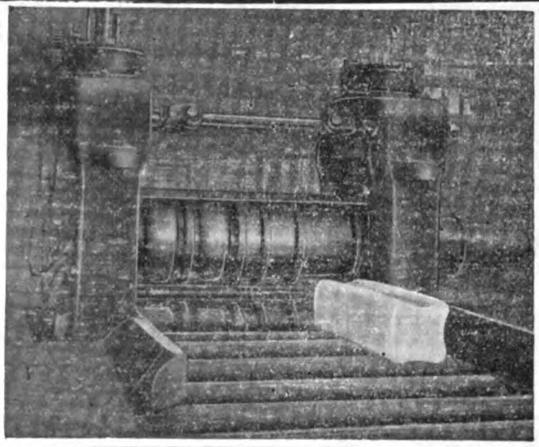

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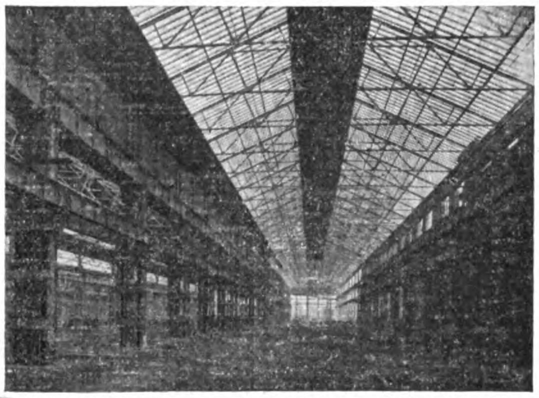

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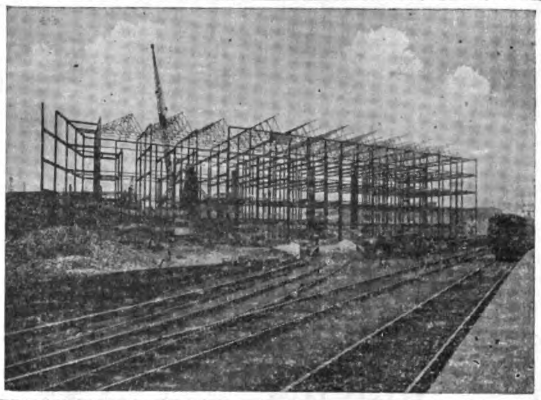

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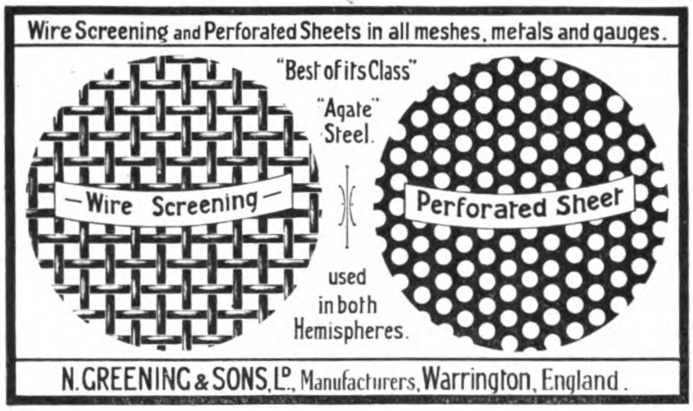

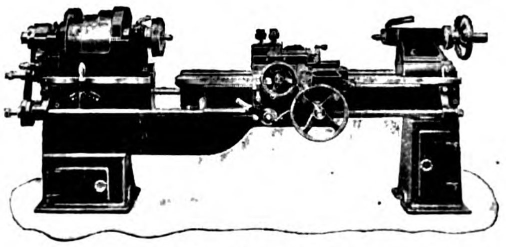

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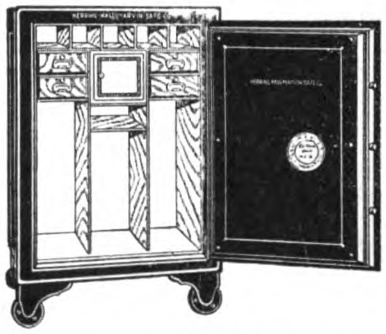

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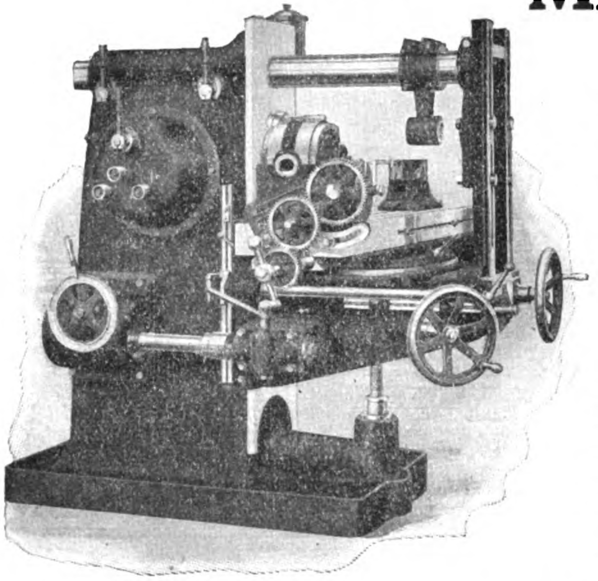

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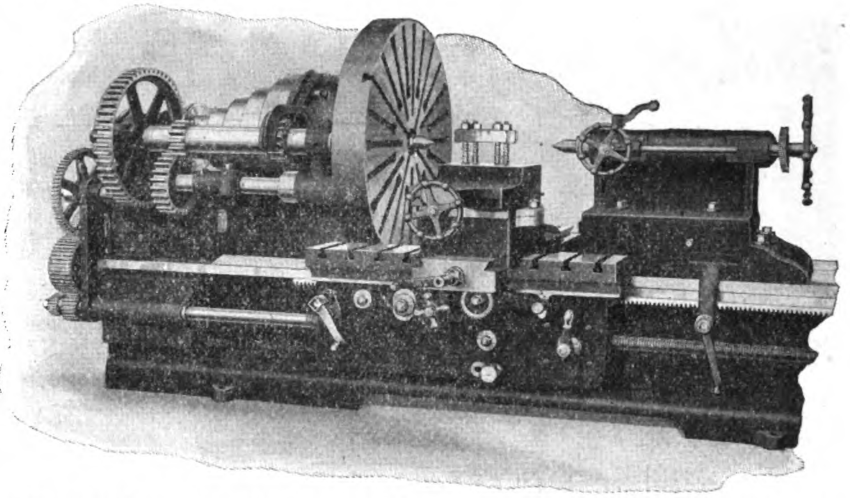

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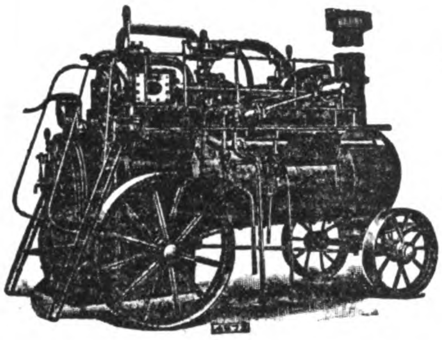

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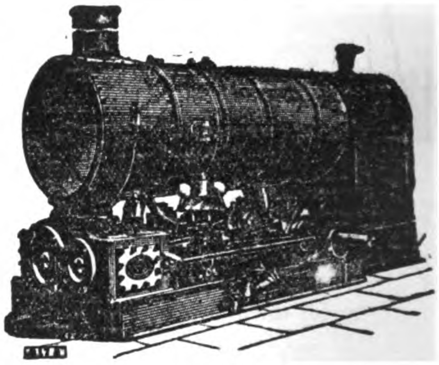

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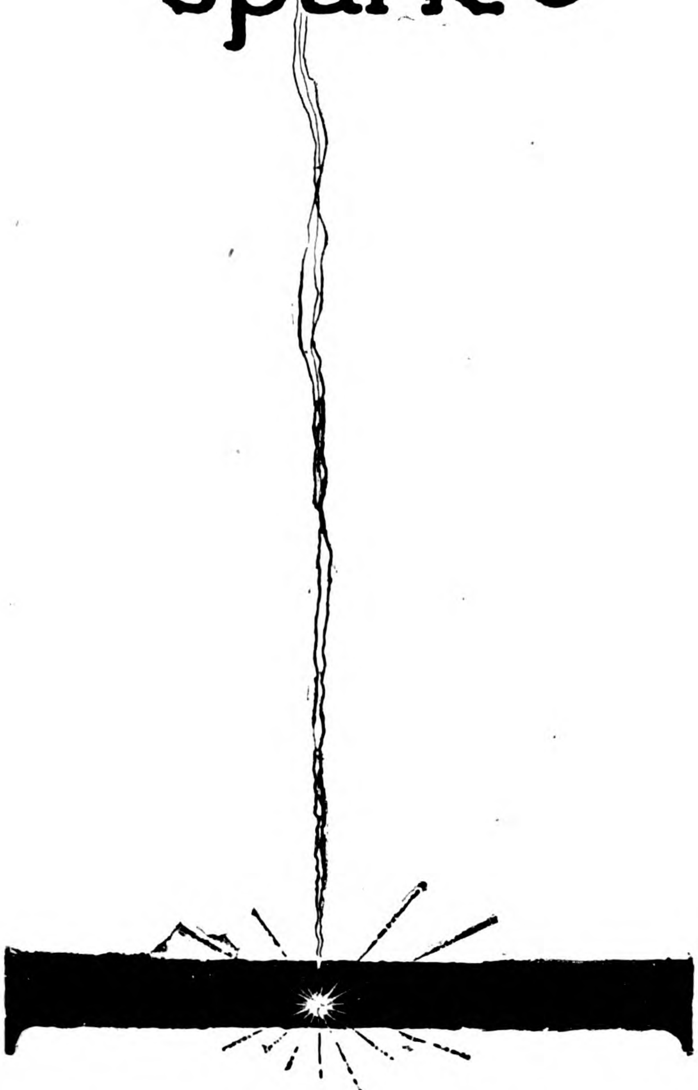

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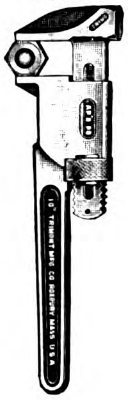

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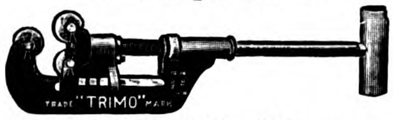

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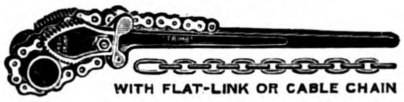

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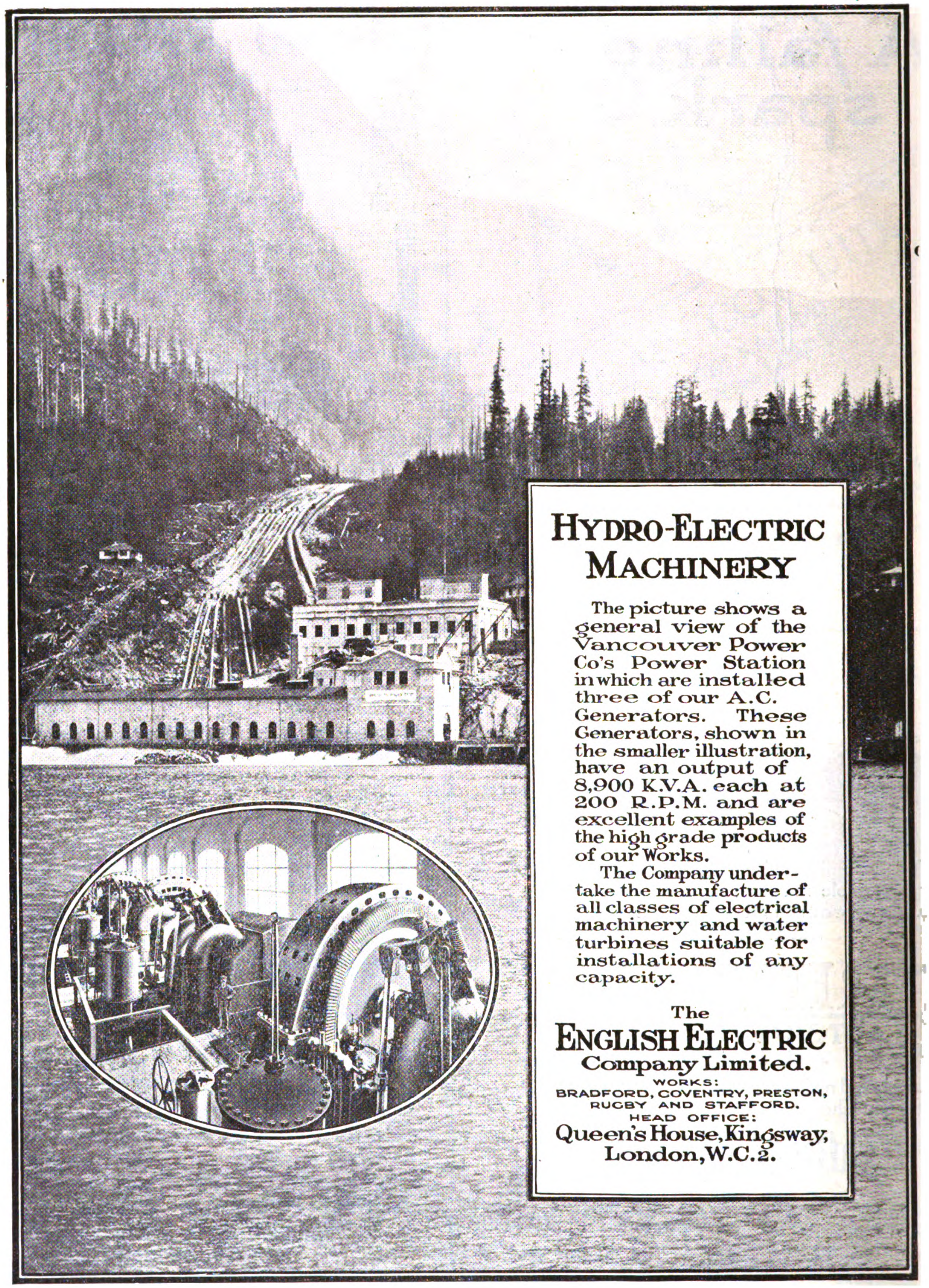

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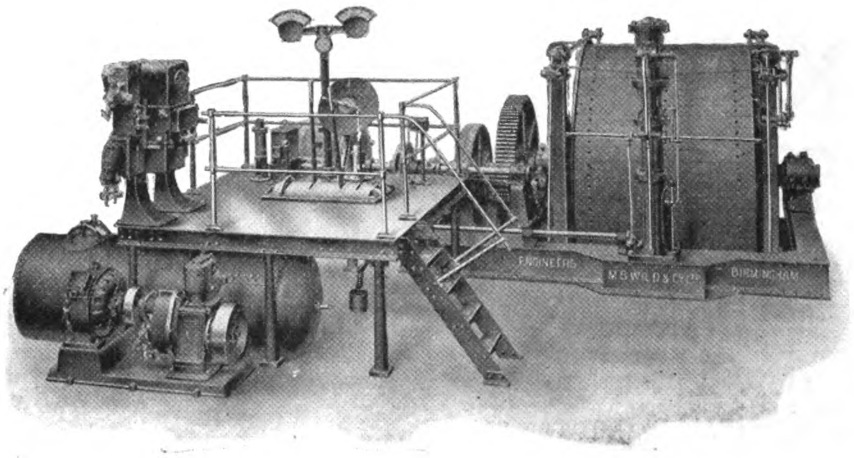

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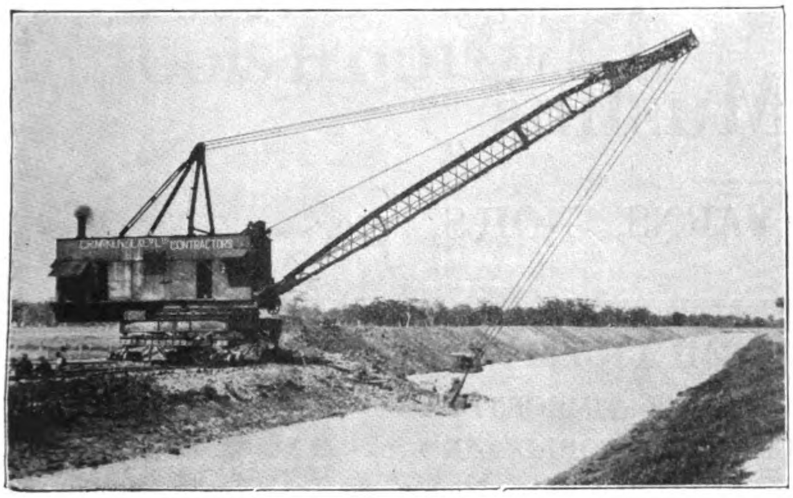

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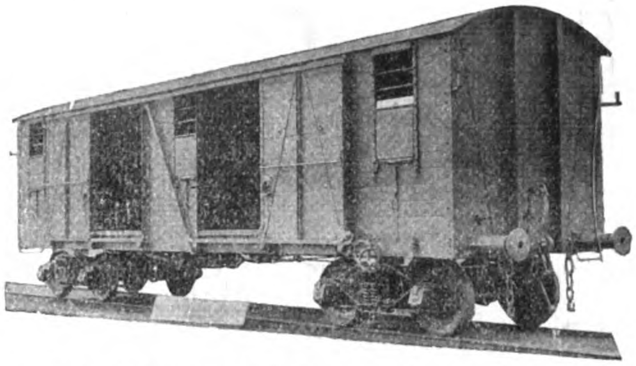

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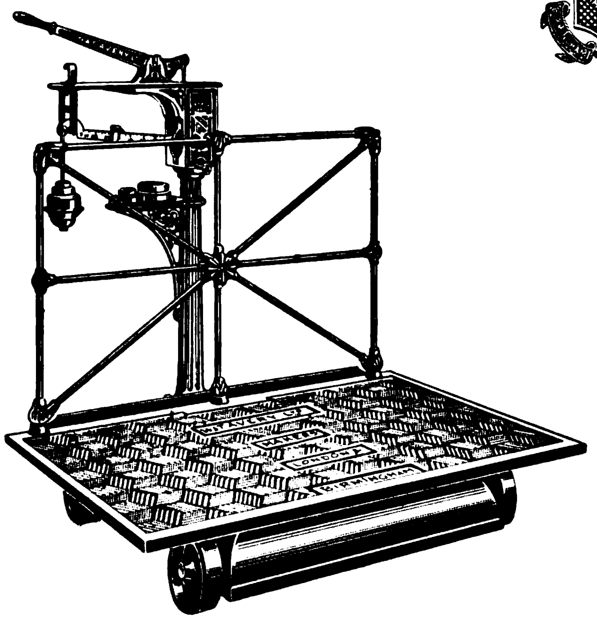

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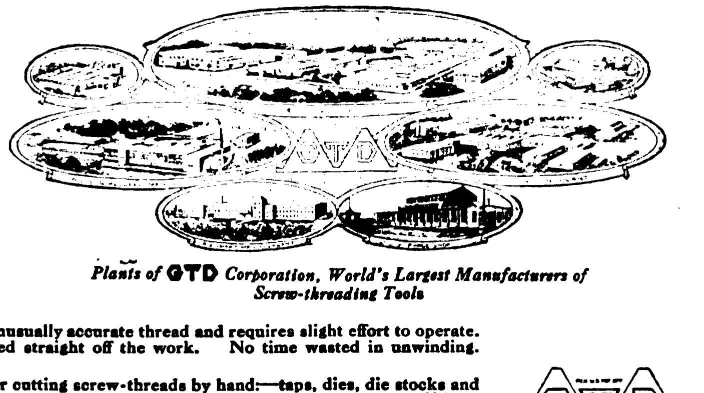

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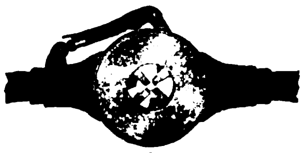

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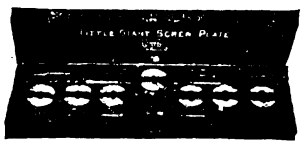

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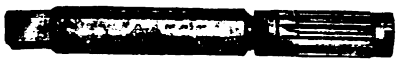

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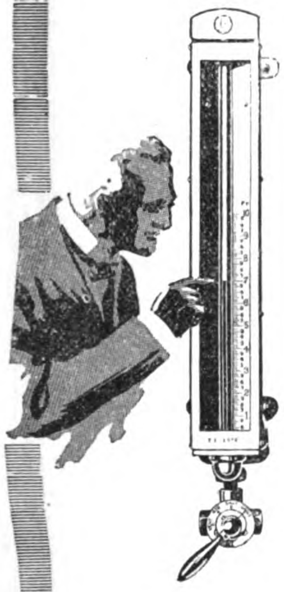

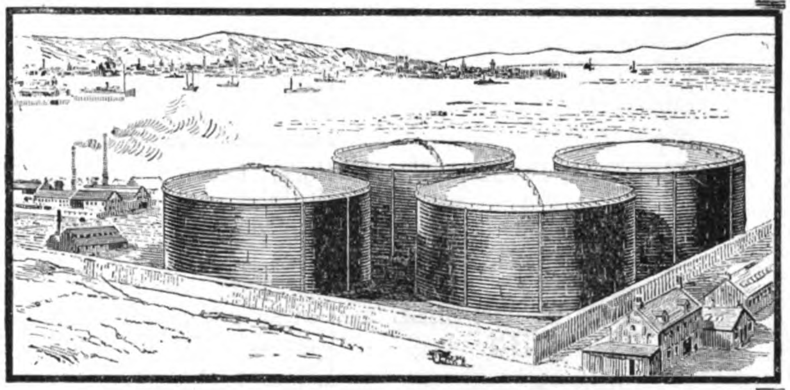

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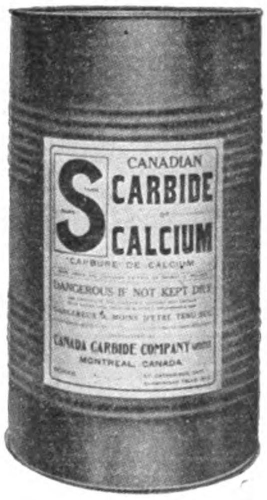

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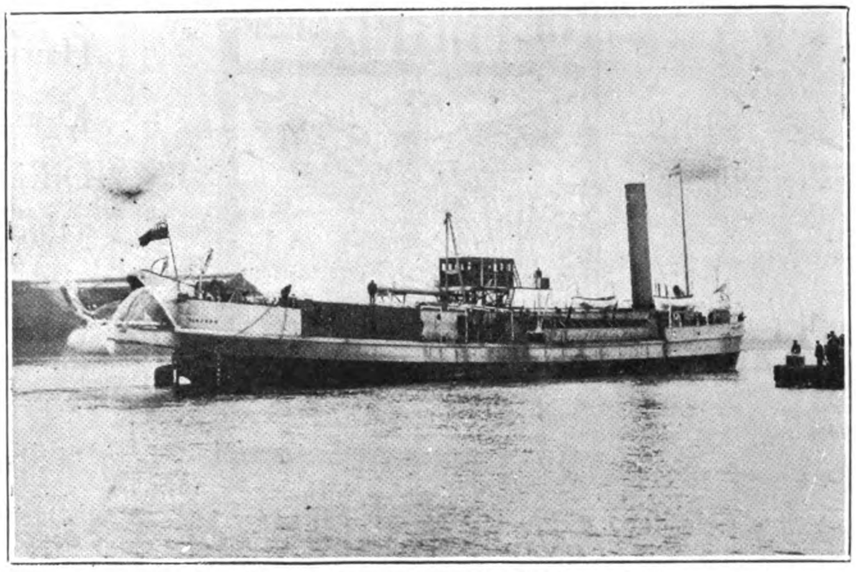

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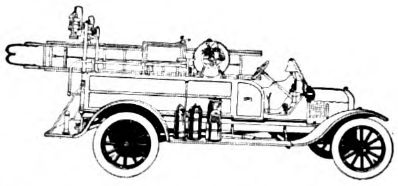

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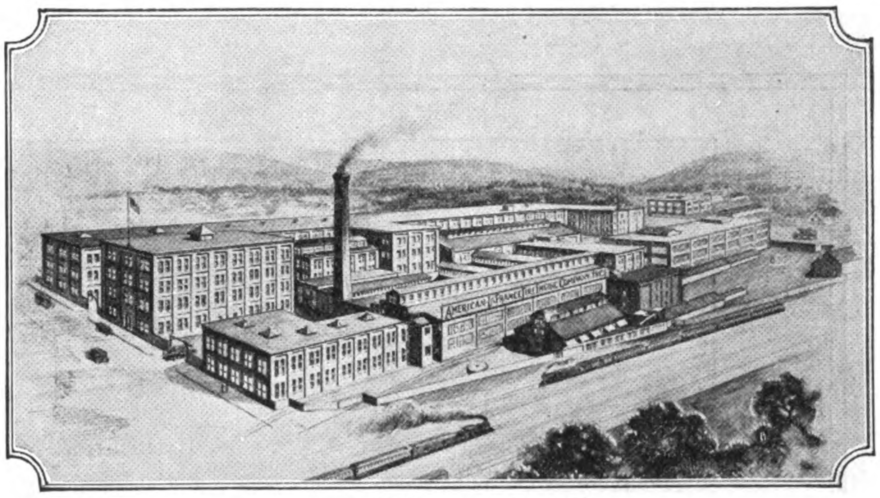

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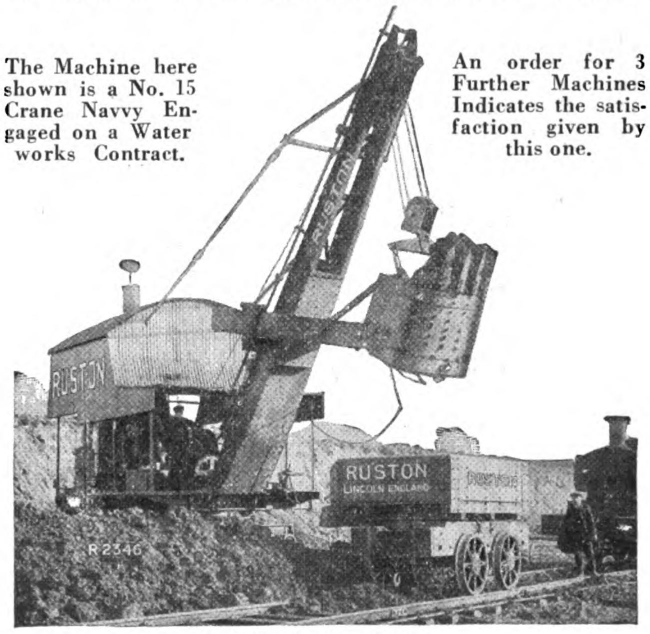

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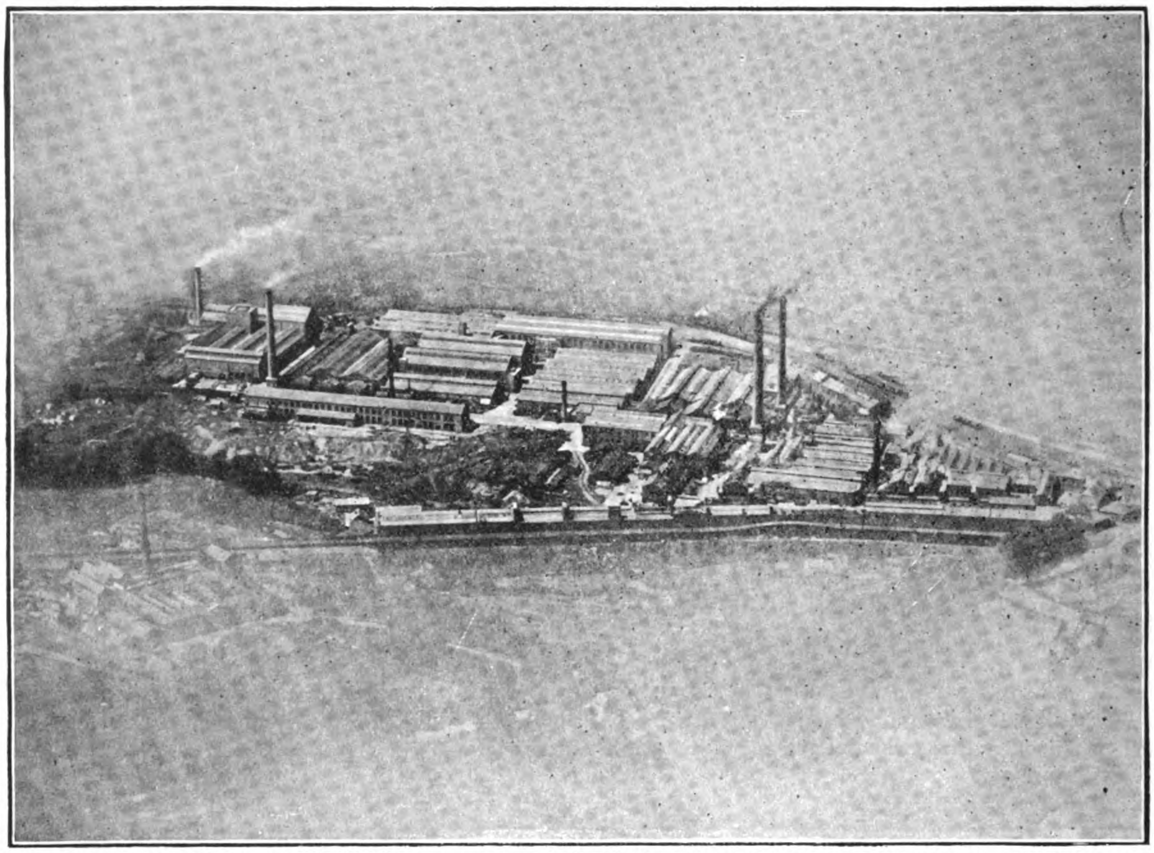

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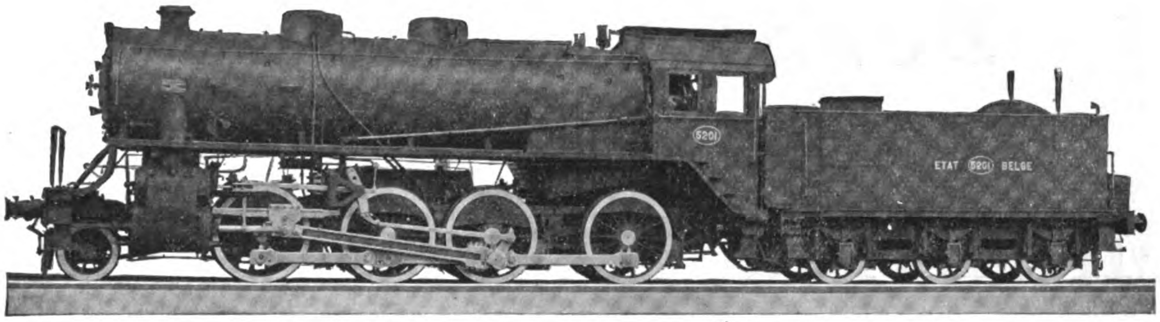

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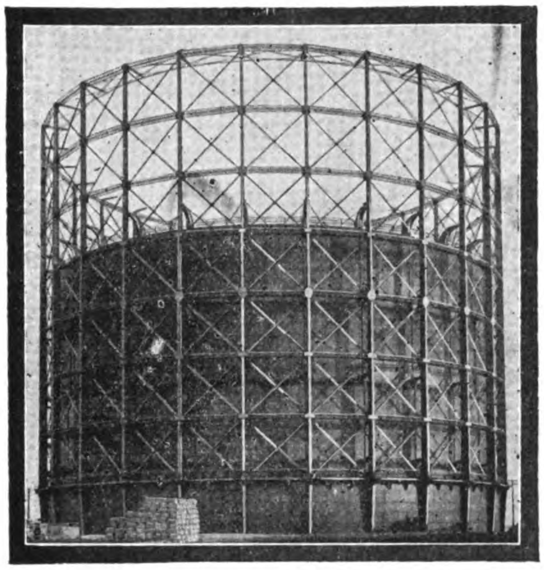

6,000,000 cu. ft, Gas Holder-Detroit City Gas Company, Detroit, U.S.A.

GOOD CRAFTSMANSHIP

To design and construct a large gas holder is one problem. To perform the task efficiently and economically and to the satisfaction of all concerned, is another. To do both is good craftsmanship.

It is this kind of co-ordination that has made the name McClintic-Marshall synonymous with good gas holder craftsmanship.

Write for Booklet 409

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Foreign Contract Dept: 50 Church Street, NEW YORK, U. S. A.
Cable Address: "Macmarsh," NEW YORK.

YOKOHAMA: H. E. Root, 50a Yamashita-cho

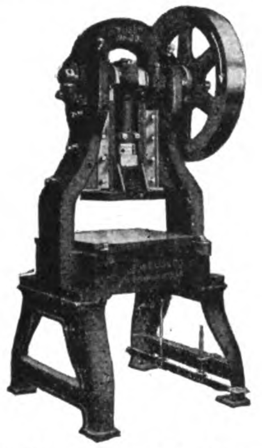
LONDON: George A. Smith, St. Stephen's House, Westminister, London, S.W. I.
PARIS: Produits Métallurgiques McClintic-Marshall, 8 Rue Edouard VII
MADRID: Hispano-American Corporation.
HAVANA: San Ignacio y Obrapia
Codes: Bentley's, General, Western Union Five Letter, Lieber Five Letter

McClintic-Marshall

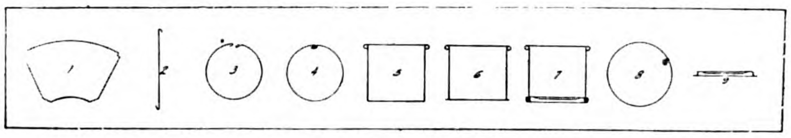
Steel Construction

MACHINERY for Manufacturing Tin Cans—Tin Ware—Metal Packages Cutlery—Hardware—Aluminum Ware and Enamel Ware—Electrical Equipment. Also Horseshoe—Minting and Drop Forging Machinery

1857 BLISS 1922



Bliss No. 30 press. One of the machines used in the manufacture of pieced tinware; it is adapted to handle a wide range of work.



The line drawing above gives an idea of the operations required in the production of pieced tinware articles such as buckets, pails, tubs, etc. etc.

Operations are as follows: Blanking body—Bar fold body blank—Form body blank—Close side seam—Wire top edge—Flange bottom of body—Double seam bottom to body—Blanking and Forming bottom. In most cases individual machines are required for each operation.

We build machinery for every requirement in the manufacture of pieced tinware and pieced sheet ironware. To quote intelligently we must have drawings or samples of each article to be produced and daily production desired.

Bliss on your machinery is more than a name, it's a guarantee.

E. W. BLISS CO. MAIN OFFICE AND WORKS **BROOKLYN, N. Y., U. S. A.**

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FOREIGN REPRESENTATIVES:

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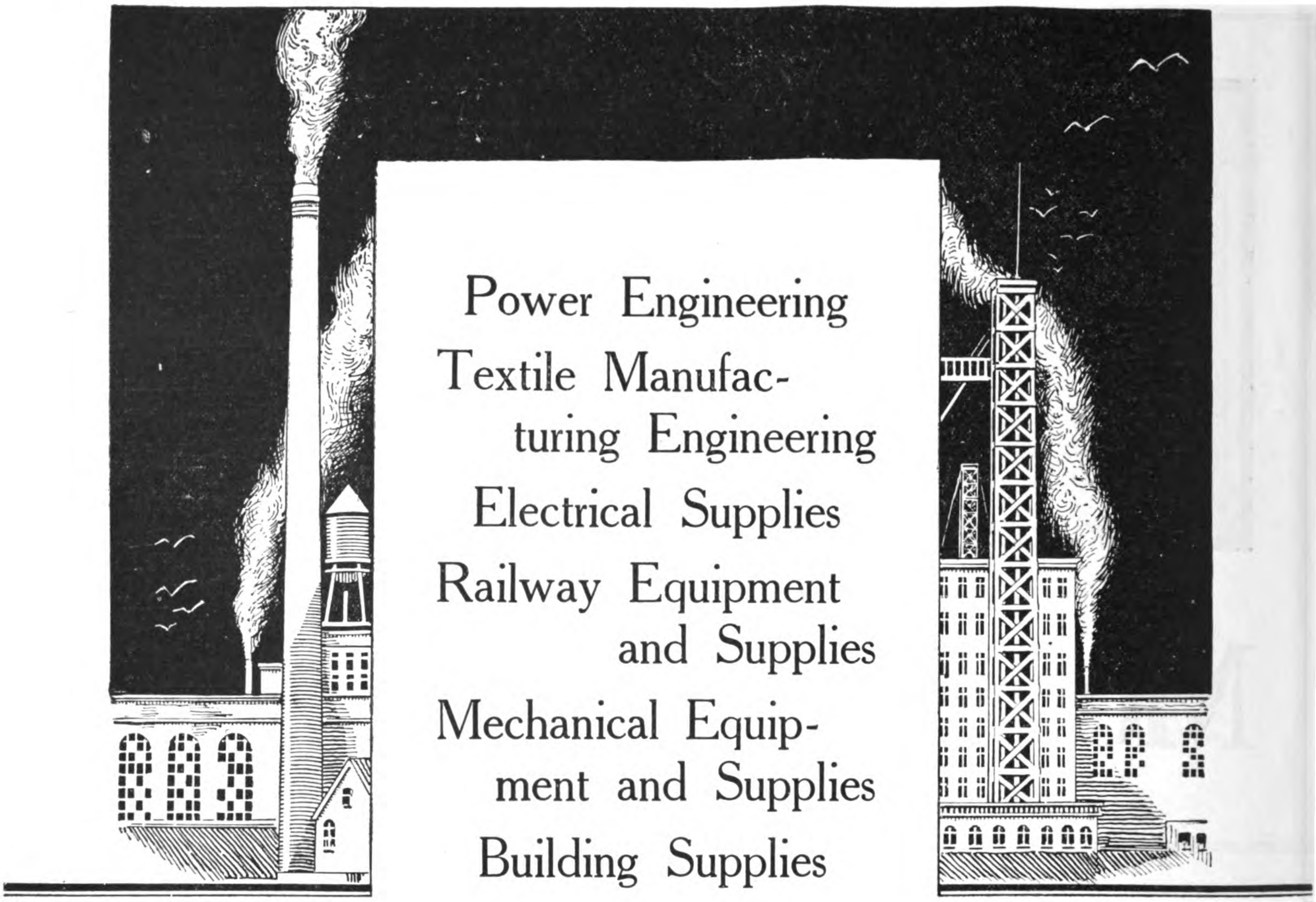
Clive Building, Calcutta

JAPAN
Horne Co., Ltd.
Tokyo, Osaka

CHINA
Allied Machinery Co. of America,
Shanghai, Tientsin, Dairen, Manchuria

No. 239



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HONGKONG

BUILDERS AND REPAIRERS OF SHIPS AND ENGINES OF ALL KINDS

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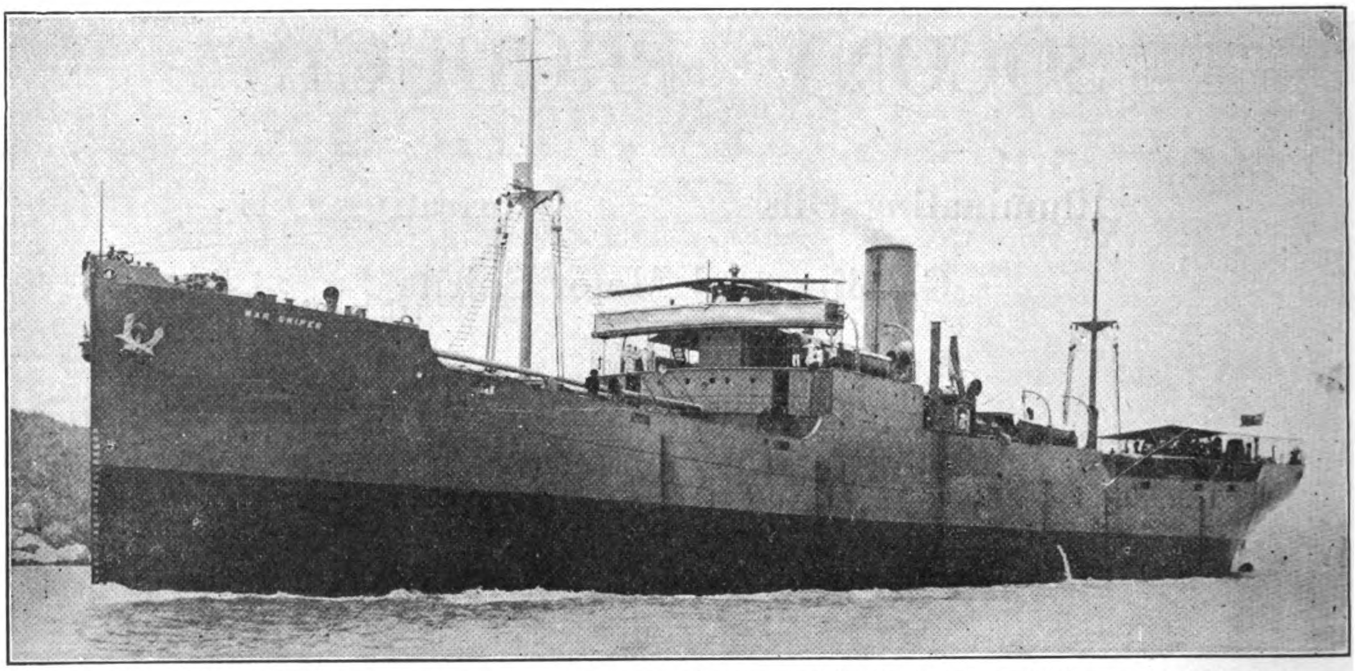
The Company possesses Six Granite Docks and Two Patent Slipways and these are Equipped for Expeditious Work. The Plant is of the most modern type throughout. Ship Owners and Captains are assured that Docking and Repairs are carried out Promptly and at Moderate Charges.



S.S. "*WAR SNIPER*," 8,200 tons d.w.—5,175 tons gross. Built and engined by The Hongkong & Whampoa Dock Co., Ltd. to the order of the British Government.

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TELEGRAPHIC ADDRESS: "MANIFESTO" HONGKONG

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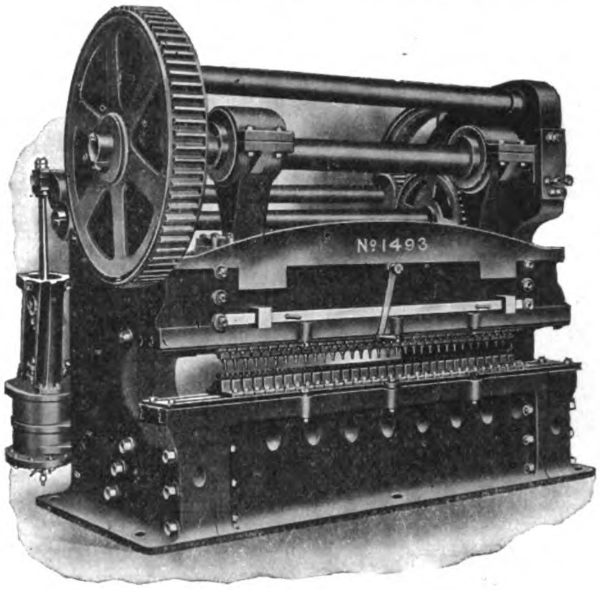

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WATER-TUBE STEAM BOILERS

SUITABLE FOR ALL INDUSTRIES, AND FOR BURNING ANY KIND OF FUEL

13,400,000 H.P. Land-type For Stationary Purposes—**6,400,000 H.P.** Marine-type Afloat

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CHAIN GRATE STOKERS

ECONOMISER

FEED-WATER HEATERS

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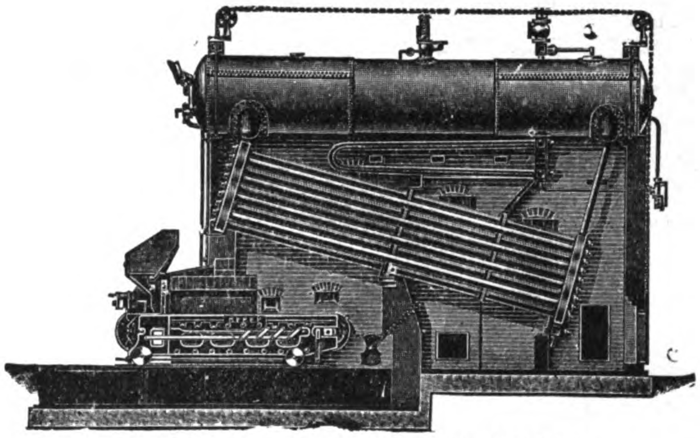

BABCOCK & WILCOX LAND BOILER,
fitted with Patent Superheater and Chain Grate Stoker

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WHITE-FORSTER WATER-TUBE MARINE STEAM BOILERS

THE BABCOCK & WILCOX STOKER, of which over 4,300 have been made, is now extensively used throughout the world for burning bituminous and smoky coal without the production of smoke. It is especially suitable in the case of Chinese and other coals, which contain a large percentage of ash, owing to the fact that the stoker is absolutely self-clinkering, and does not require to be touched with firing tools. It is the only mechanical grate which, after extensive trials, has proved to be an unqualified success in burning bituminous coal efficiently and smokelessly.

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Boilermakers, Dock Proprietors, Shipbuilders, Engineers and Electricians

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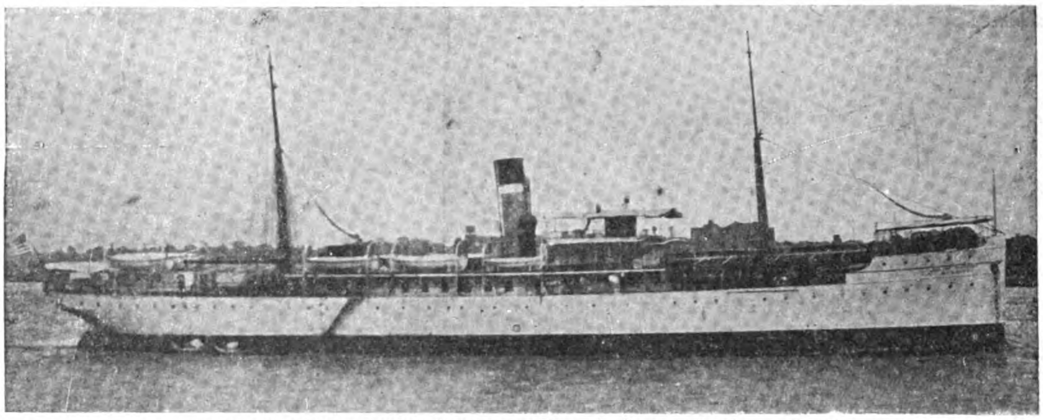

U.S. ARMY TRANSPORT "MERRITT," 300′ 0″ × 45′ 0″ × 28′ 3″

Cable Address "FARNHAM"
Codes Used, A.B.C. 4th, 5th & 6th Editions A-1, Watkin's, Scott's, Western Union, Bentley's and Engineering.

The "Merritt" is one of Twenty-Seven Steam Vessels built during the last few years to the order of The American Government for service in the Philippine Islands.

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"F.B." INTERNATIONAL CODE

Berths for Building Steamers up to 10,000 tons Deadweight Capacity.

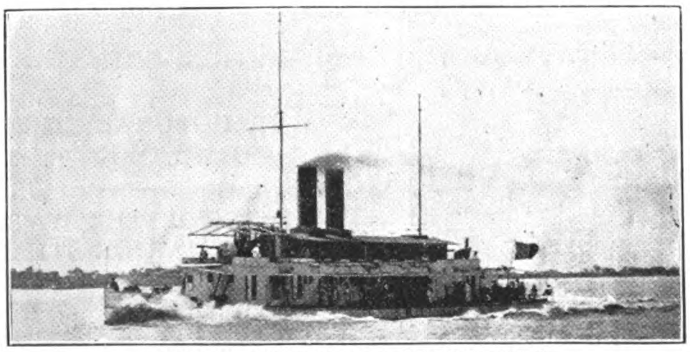
Representatives and workmen attend vessels at Woosung and outports on request.

☛ Telegraphic and Wireless Instructions from vessels promptly attended to

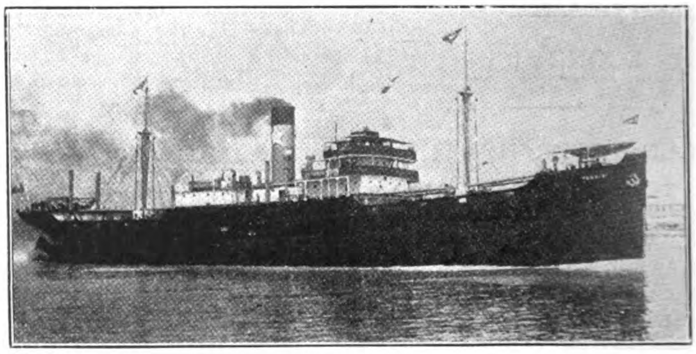
ENQUIRIES SOLICITED

PARTICULARS OF DRY DOCKS

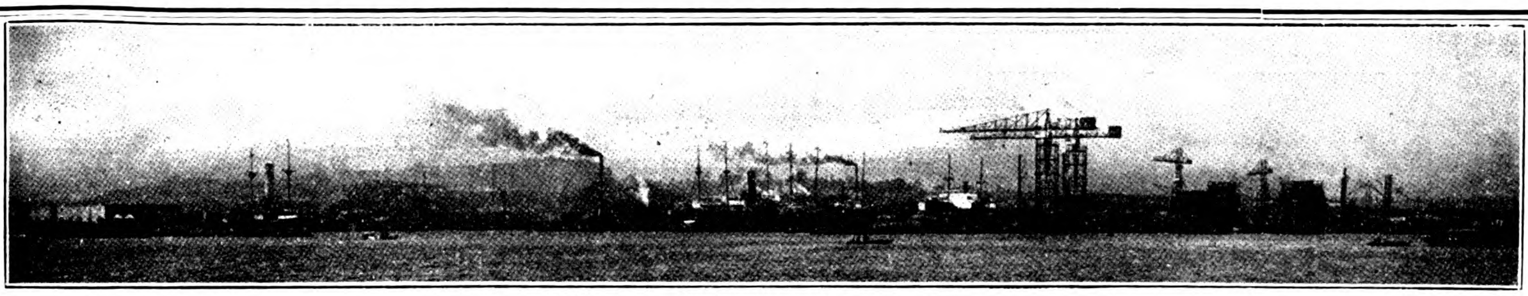
Names	Length on Blocks	High Water	
		Breadth of Entrance	Depth of water on Sill
Cosmopolitan Dock ...	700 feet	80 feet	27 feet
International Dock ...	528 ,,	77 ,,	23 ,,
Old Dock	399 ,,	53 ,,	16 ,,
Tunkadoo Dock ...	350 ,,	67 ,,	16 ,,



H.I.M.S. "ERMANNO CARLOTTO"
Designed and Constructed for the Royal Italian Navy
Length 160 feet. Twin Screw Engines.
Draft 2 feet 10 inches with full equipment and 30 tons of coal on board. Mean continuous speed 14 knots per hour.



S.S. "YANNIS" ex "WAR TIARA"
Sister Ship s.s. "PANAGIS" ex "WAR DIADEM"
Sister Ship s.s. "MELLON" ex "WAR REGALIA"
Built for the British Government.



View of Yokohama Dock Co., Ltd.

THE YOKOHAMA DOCK COMPANY, LTD.

Dock Owners, Shipbuilders, Repairers, Engineers, Machinists, Boiler Makers and Warehousemen.
Operating Dockyard, Shipbuildingyard and Storage Warehouses at Yokohama, Japan.

Head Office: Nagasumi-cho :: *Warehouse Office:* Midori-cho

Builders for
United States Shipping Board,
Japanese Navy,
Nippon Yusen Kaisha,
and other Principal Shipowners

Cable Address:
"DOCK"
Code Used:
A. 1. A.B.C. 4th and 5th, Bentley's

DRY DOCKS:

No. 1	625′ × 80′ × 28′
No. 2	380′ × 50′ × 26′
No. 3	480′ × 63′ × 21½′

SHIPBUILDING BERTHS:

No. 1	400′ × 27′
No. 2	490′ × 30′
No. 3	580′ × 36′
No. 4 } No. 5 }	680′ × 38′

WAREHOUSES:	TSUBO.
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Concrete Building	1,636.99
Brick Building	2,011.72
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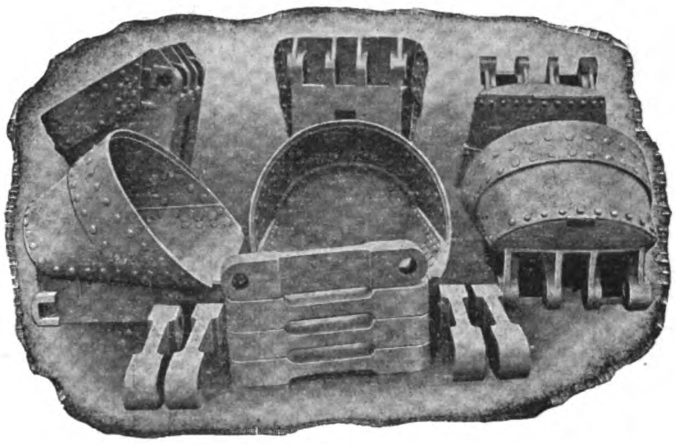

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"Imperial" Manganese Steel, whether used for the lips of dredger buckets, the bucket chain links, pins or bushes, means fewer stoppages due to breakage or rapid wear. As an example, the following extract from a letter may be quoted: "Up to the time I left West Africa the three bucket dredgers (gold dredging)

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One dredge has been at work nearly two years, and the other two six months. I think the wear of the pins consitutes a record." What would a record like that mean to you in money saved?

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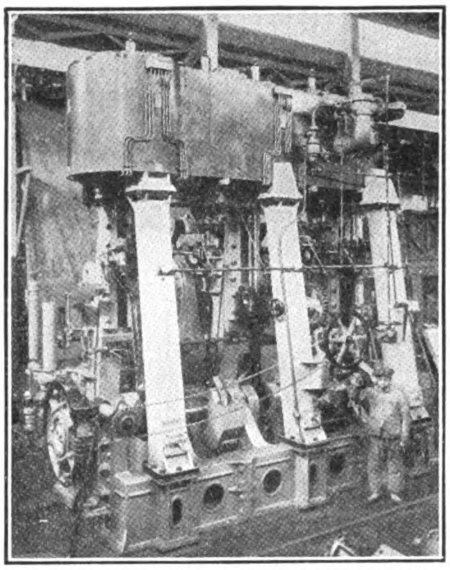

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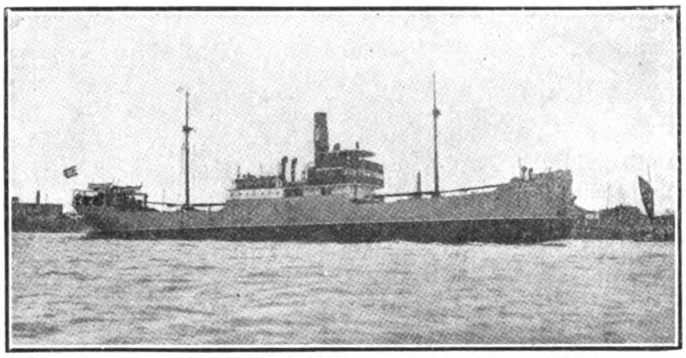


S.S. "Halvdan," one of 8 Steamers Built and Engined at Works

SHIPBUILDERS

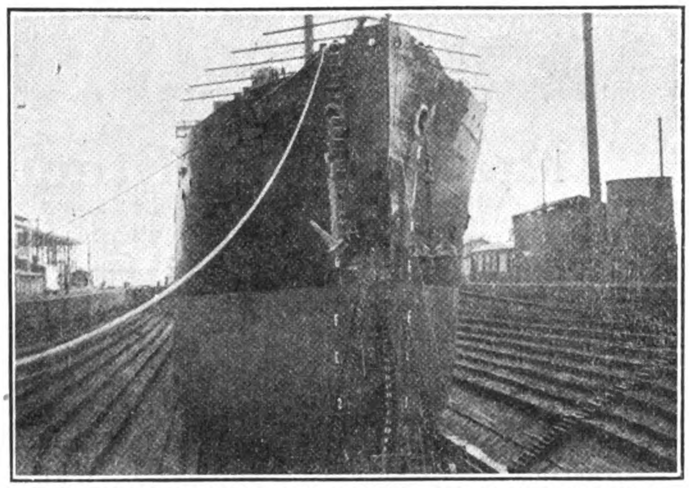
Ocean and River Craft — Oil Carriers

Auxiliary Schooners

Shallow Draft Passenger and Cargo Vessels

Steam or Motor Driven

Steel, Wood or Composite built.



7,000-ton Steamer Docked for Repairs of Damage Sustained in Collision

DOCK PROPRIETORS

Yangtszepoo Dock

Length	577'-0"
Entrance	70'-0"
Width of Sill	60'-0"
Depth on Sill	20'-0"

Patent Slips

for vessels up to 200-ft. long

Vessels docked promptly

General Repairs, Annual Overhauls and Re-classification Work executed efficiently and expeditiously under European Supervision.

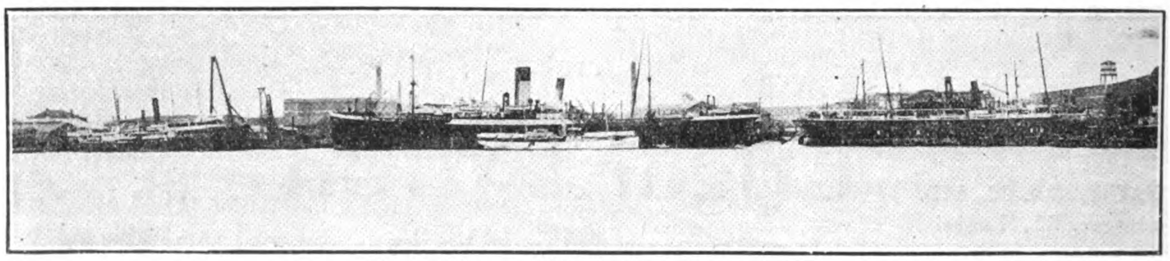
Moderate Charges

Vessels undergoing repairs accommodated at wharves alongside Works.

The Works are equipped with the latest Machine Tools, Electric Drills, Pneumatic and Hydraulic Plant and Tools, Quasi-Arc Electric Welding and Oxy-Acetylene Welding, Galvanizing Plant.

Salvage Experts, Divers and a comprehensive Salvage Plant. Floating Cranes to lift 50 tons and Sheerlegs to lift 80 tons.

THE PROPERTY OF THE COMPANY COVERS AN AREA OF ABOUT 40 ACRES with a RIVER FRONTAGE of 1,800-ft.



General View of Works from River Side

Showing 8 Steamers Berthed Alongside Undergoing Repairs.

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"DOCK" DAIREN

A1, A.B.C. (4th and 5th),
Engineering, Scott's, Lieber's
Bentley's
and
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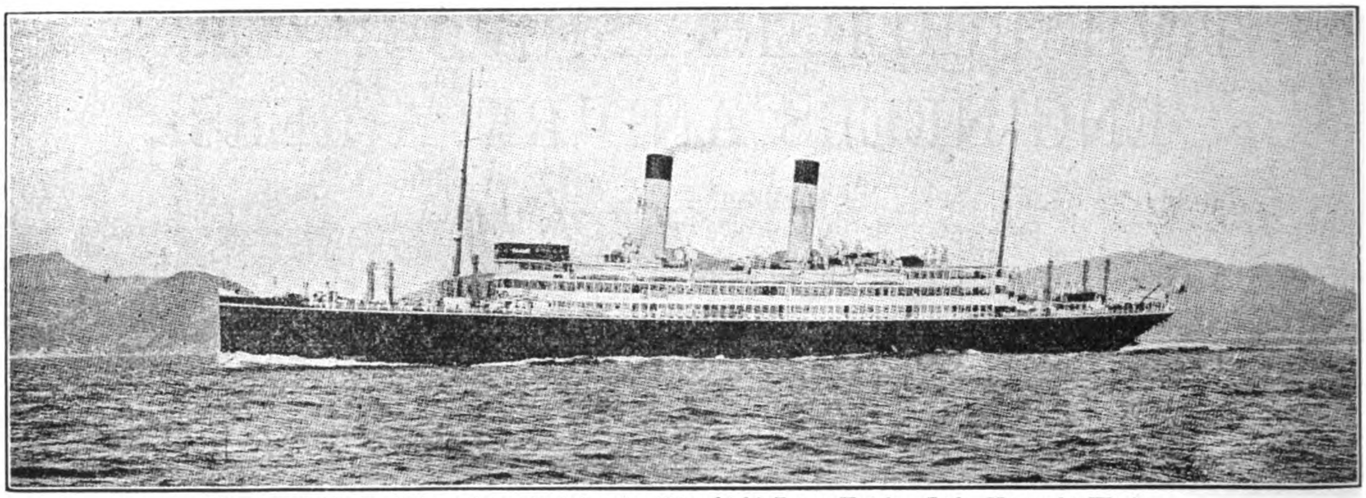

The *Tenyo Maru*, built and engined by the Mitsubishi Zosen Kaisha, Ltd., Nagasaki Works

MITSUBISHI ZOSEN KAISHA, LTD., NAGASAKI WORKS

(ex Mitsubishi Dockyard & Engine Works, Nagasaki)

DOCK No. 1

Extreme Length - - - - -	523	Ft.
Length on Blocks - - - - -	513	,,
Width of Entrance on Top - -	89	,,
,, ,, ,, ,, Bottom-	77	,,
Water on Blocks at Spring Tide	26½	,,

DOCK No. 2

Extreme Length - - - - - -	371	Ft.
Length on Blocks - - - - - -	350	,,
Width of Entrance on Top - - -	66	,,
,, ,, ,, ,, Bottom -	53	,,
Water on Blocks at Spring Tide -	24	,,

DOCK No. 3

Extreme Length - - - - - -	728.9	Ft.
Length on Blocks - - - - -	714	,,
Width of Entrance on Top - -	99½	,,
,, ,, ,, ,, Bottom -	88½	,,
Water on Blocks at Spring Tide	34½	,,

THE BEST EQUIPPED SHIPBUILDING PLANT IN THE FAR EAST

With Special Facilities for Handling the Heaviest Castings and the Repairing or Building of Ships, Engines, and Boilers
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LARGE STOCK OF MATERIAL AND FITTINGS ALWAYS ON HAND

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150 FEET HIGH

PEKING

Constructed of Tubes

6" Dia. to 2½," Dia.

Manufactured by

NATIONAL TUBE COMPANY

Fabricated and Erected by

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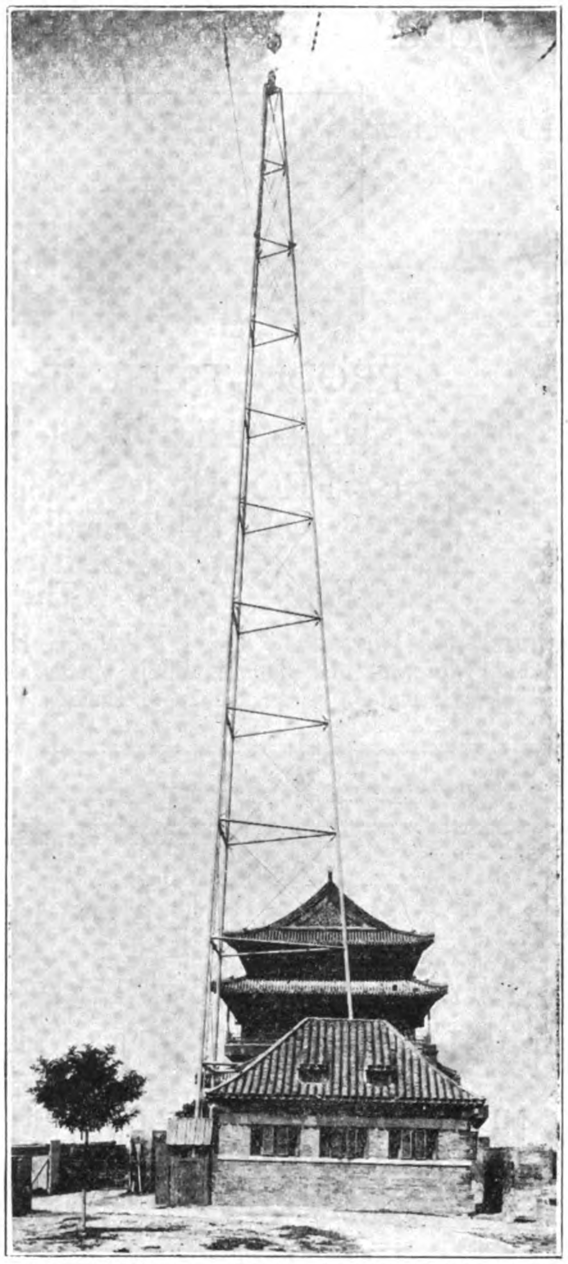

National Tube Company Standard Steel Water Pipe
6" - 5" - 4" - 3½" - 3" - 2½" by 150'
United States Government Wireless
Marine Barracks, Peking

"National" Tubular Products

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15 NAKADORI MARUNOUCHI	UNION BUILDING THE BUND AND CANTON ROAD SHANGHAI	22 WU LIANG TA JEN HUTUNG
TOKYO, JAPAN	CHINA	PEKING, CHINA

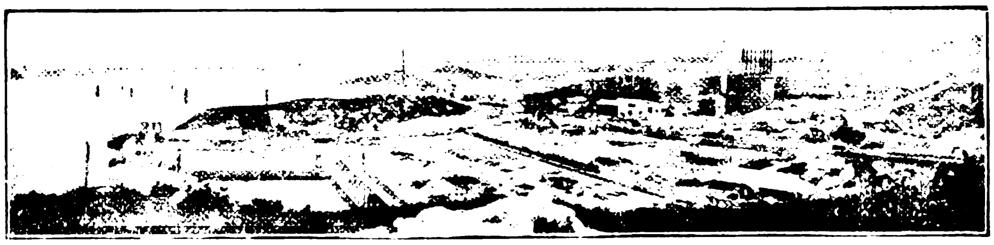
MITSUBISHI IRON AND STEEL CO., LTD.

(MITSUBISHI SEITETSU KAISHA, LTD.)

HEAD OFFICE: MARUNOUCHI, TOKYO

CAPITAL: (PAID UP) YEN 30,000,000

MILL (LLOYD'S APPROVED) KENJIHO, CHOSEN (KOREA)



PRODUCTS PIG IRON—Basic & Foundry 100,000 tons.

STEEL—High Tensile & Mild Steel 50,000 tons.

BY-PRODUCTS—Sulphate of Ammonia; Pitch; Naphthalene; Tar Oil (light, middle, heavy); Slag-Cement, Slag Wool.

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SUBSCRIBED CAPITAL - - Yen 5,000.000
PAID-UP CAPITAL - - - ,, 1,250.000

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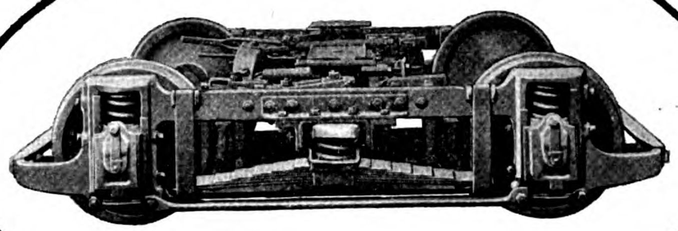
General Managers of the

KYODO UNYU KAISHA

YOKOHAMA

3 KAIGAN-DORI, ITCHOME
YOKOHAMA
WITH TWO BRANCHES IN TOKYO



No. 77-E Truck
24 or 26-in. Wheels

For
LOW-LEVEL CARS

Far East Representative:
Andersen, Meyer & Co., Ltd., Shanghai
Pacific Commercial Co., Manila

BRILL

Main Office and Works
PHILADELPHIA, U.S.A.

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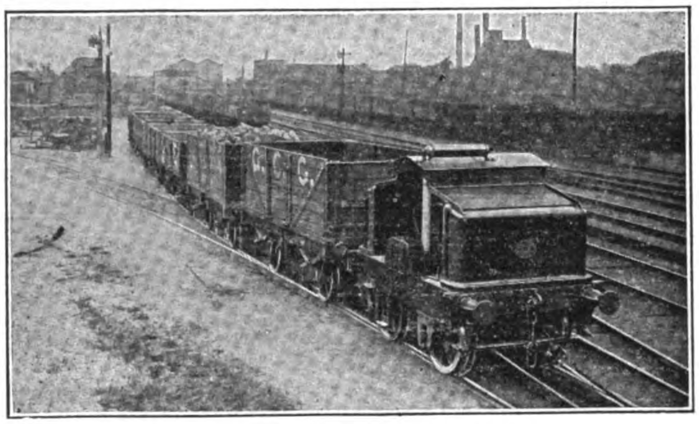

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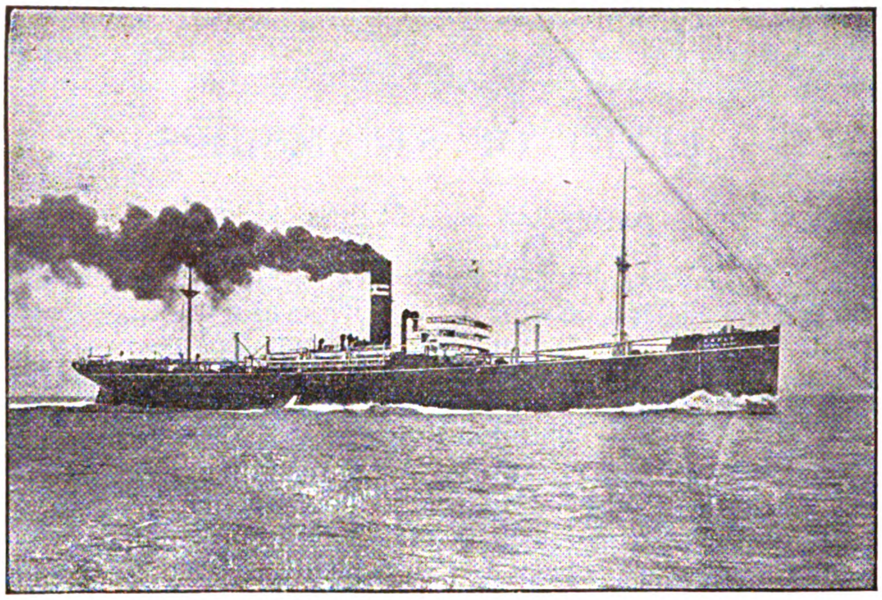

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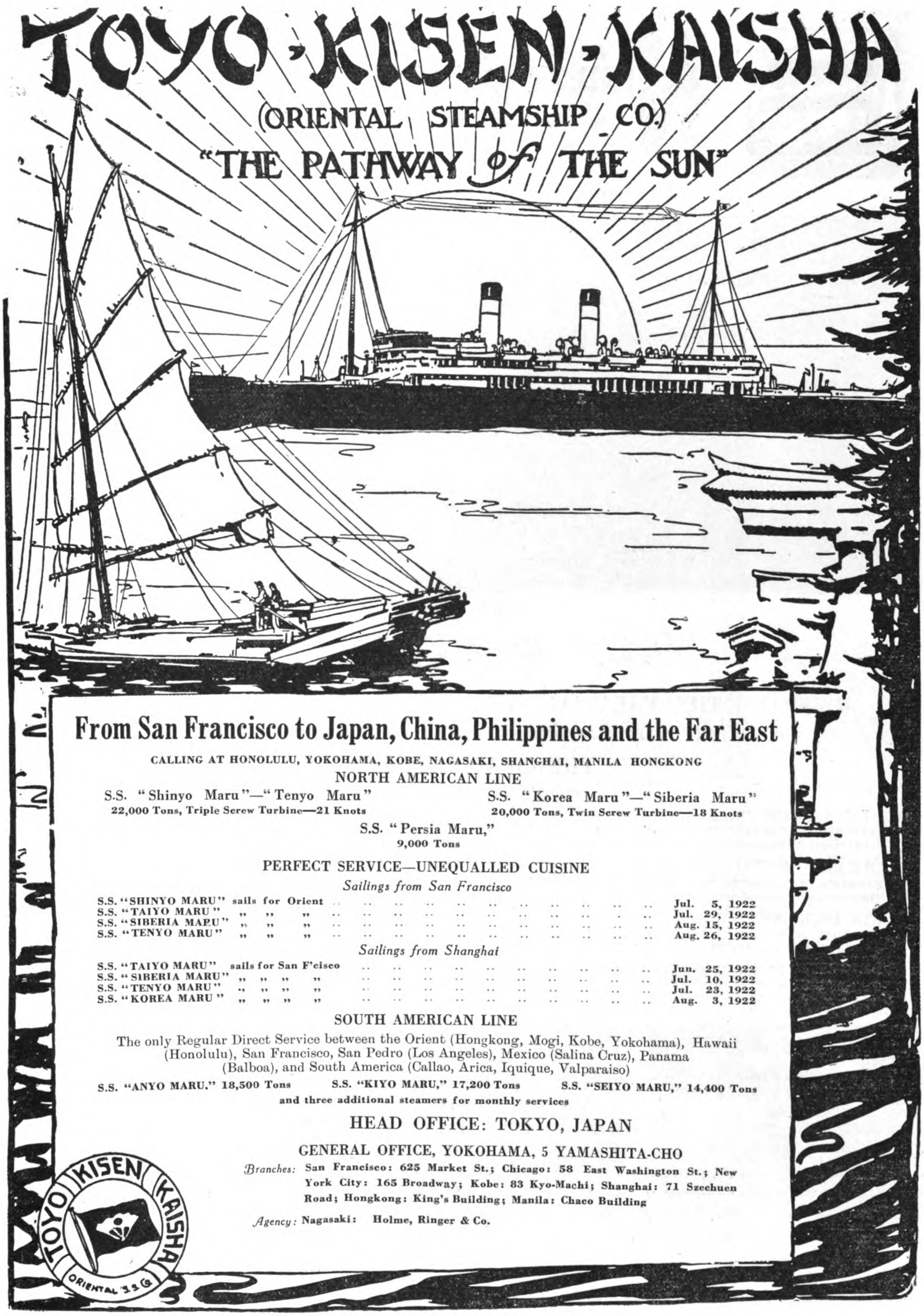

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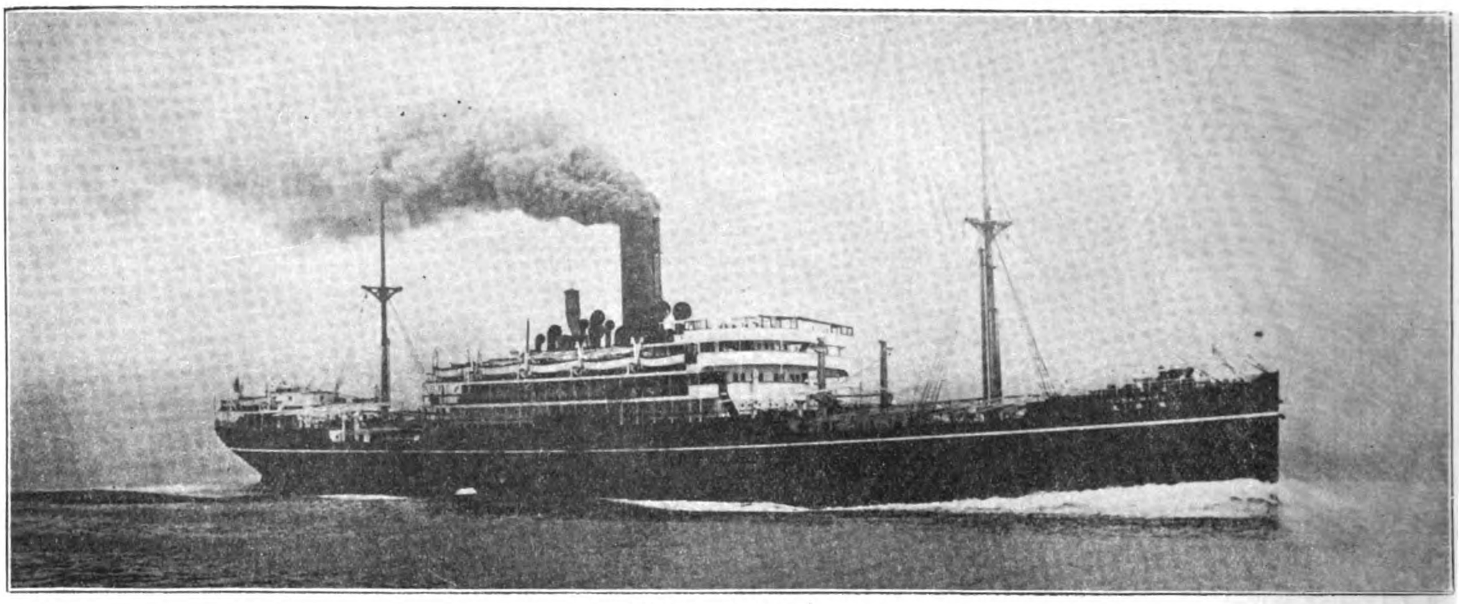

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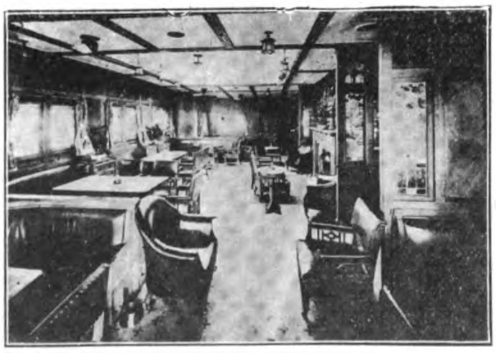

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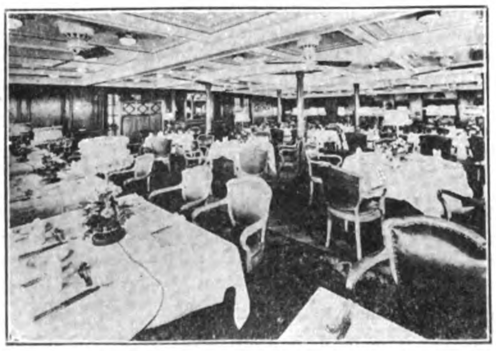

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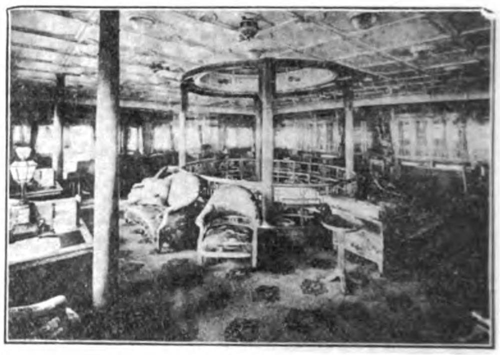

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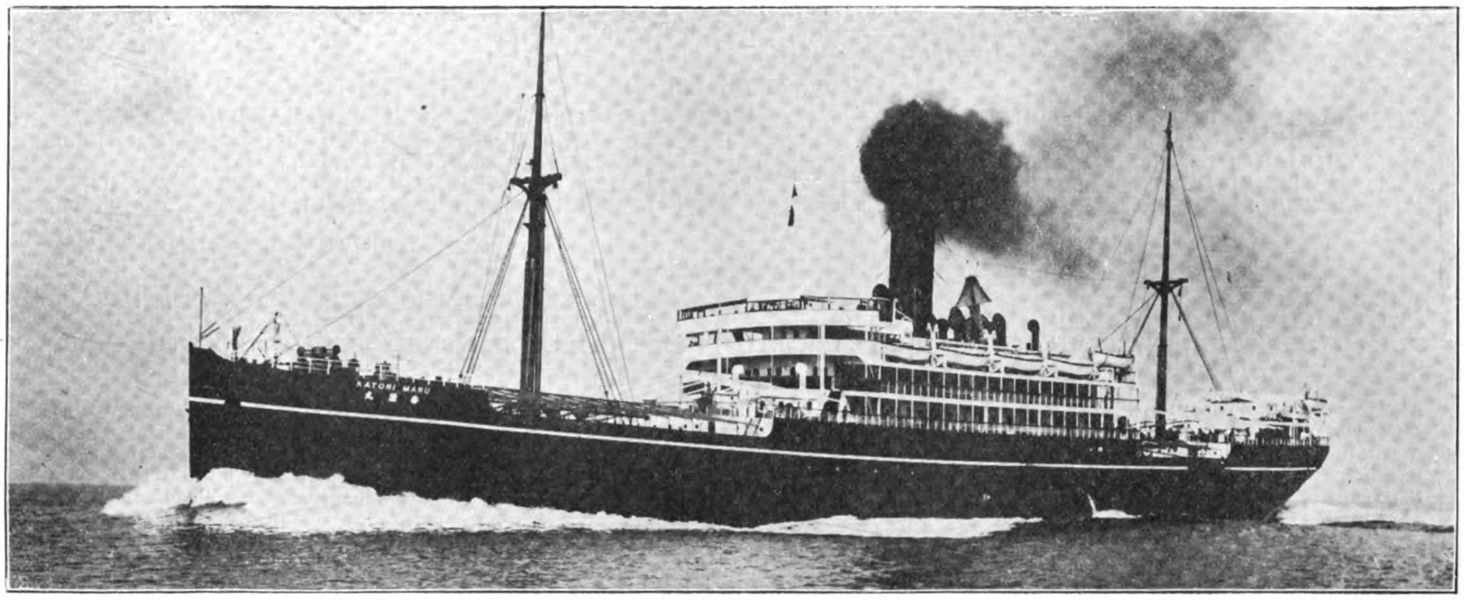

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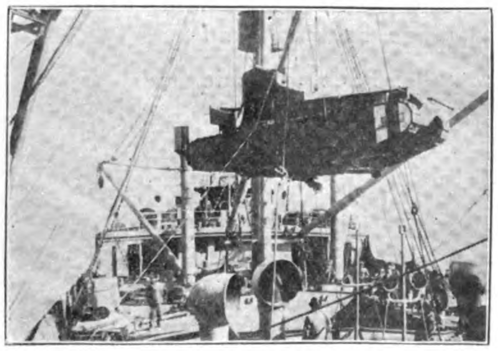

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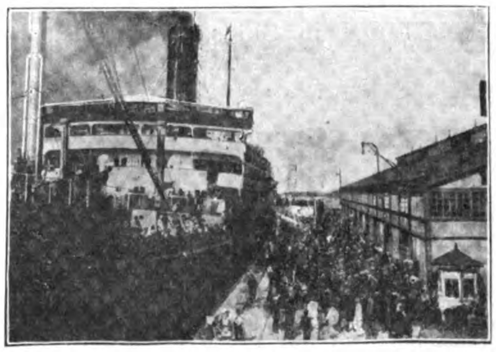

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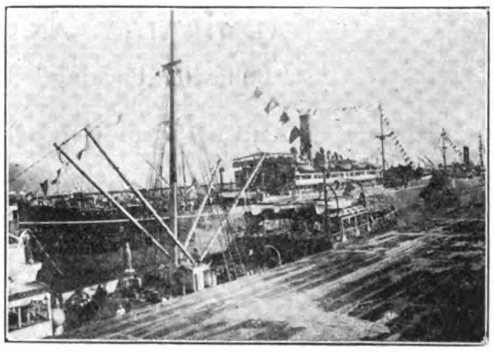

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(From The New York Times)

The Far Eastern Review

ENGINEERING FINANCE COMMERCE

VOL. XVIII SHANGHAI, JUNE, 1922 No. 6

WATCH NORTHCLIFFE

Some Simple Words of Common Sense

(Japan's Standing Army Numbers 230,000 Men)

ONE wonders just what is at the bottom of the new anti-Japanese campaign launched in England by Viscount Northcliffe. Coming as it does immediately after the Washington conference and the collapse of the former campaign to provoke hostilities in the Pacific, it would seem that the owner of *The Times* had decided to fire the hearts of the British into taking over the job that America rejected.

Thanks to the Washington conference, war between Japan and America was averted by a frank exchange of views and the whole world now knows exactly where Japan stands in regard to her policies on the mainland of Asia. Is her word to be doubted and her honor placed in question before she has even time to make good ? Have the prime-movers of the anti-Japanese campaign prevailed upon Northcliffe to carry on and keep alive the agitation in the hope of discrediting Japan in Great Britain, and turning the British against their former ally in the same manner as they almost provoked a war between Japan and America by their one-sided testimony ? The anti-Japanese agitation received a well-merited rebuke in the United States. The Americans will have none of it and there are indications that an official enquiry is to be started in order to ascertain who was at the bottom of this diabolical attempt to bring about hostilities in the Pacific. Yet Northcliffe takes up the campaign where the American fire-eaters left off, with a vehemence and virulence that relegates them to a back seat.

Japan's Army for Defense

" For what purposes are the great Japanese home and over-seas army and the great Japanese fleet being maintained," he asks and then answers the question to his own satisfaction: *For the control of China*. Northcliffe might have answered that question by a little superficial study of Far Eastern history without swallowing hook, bait sand sinker the stories told him by those interested in creating a wrong impression. He would have been able to state, and state truthfully, that Japan is maintaining a large army for the identical reason that his own government insists upon having the greatest navy on earth, for the identical reason that France maintains the largest army in Europe, for the identical reason that Italy refuses to disarm, for the identical reason that France demanded an adequate submarine force to protect her against a possible enemy, for the same reason that all nations of real men have from time immemorial maintained large armies and fleets and for the same reason that these same nations of men will continue to do so until the trump of Gabriel's horn sounds the end to all mundane strife. Japan is maintaining her great army for defense.

Against whom ? For the same reason that the late allies are preserving intact their fighting forces in Europe, with this difference. While the allies fear Germany, Japan is watching Russia. It is nauseating to read the arguments advanced to justify the maintenance of allied forces in preparation against a war of revenge on the part of Germany when the latter nation is down and out for another twenty-five years, and then read the villification of Japan by the same writers because she insists on applying the same law of self-preservation against the possible come-back of Russia. It is the most hypocritical piffle that has ever disgraced the pages of European and American journalism. What is good for England, for France, for Italy, is good for Japan. Her old enemy outnumbers her four to one, and if Japan ever goes to sleep and listens to the siren song of the pacifists, her days as a nation will be numbered, in the same way that if Britain ever surrenders her naval supremacy, the story of her greatness will become ancient history.

Now Northcliffe would have the world believe that the Japanese army is maintained for the sole purpose of conquering China. He is not impartial enough to state that China's weakness has been the bridge over which Russia has in the past advanced to the conquest of Japan. In the sudden passion to befriend China, Northcliffe loses sight of the fundamental moves of twenty-two years ago which gave rise to the whole Far Eastern problem, the moves by which Russia would have gained her objective and found the coveted road to India through the domains of her ally and dupe. Northcliffe overlooks that the war of 1905 was not only a life and death struggle for Japan, but one in which the very existence of the British empire was at stake. For had Russia gained the victory, her armies would have swarmed into Western China, into Tibet, down through the passes of the Himalayas, and taxed the man-power of the British empire to have kept them from overflowing into India. Why do British writers close their eyes to these truths and refuse to recognize Japan's precarious position ? Is it not true that Russia's preparations for a war of revenge, compelled the Japanese to stagger under a heart-breaking burden of taxation in order to maintain their fighting forces at a level that would enable them to defend themselves (and the British empire) when the day arrived for Russia to again take the field ? Is it not true that Russia amputated Mongolia from China for the sole purpose of attacking Japan's position in Manchuria from its most exposed side ? Is it not true that Russia was secretly building her strategic railways from Bokhara to the Afghan frontier at the same time ? Why then should Japan relinquish her one guarantee of national existence in order to meet the criticisms of those who demand that their own defenses be maintained against the recuperation of Germany ?

An Overworked Bogey

Northcliffe is holding up the bogey that has been worked to death for the past ten years in order to frighten China. *The Japanese will get you if you don't be good.* This old scarecrow has served its purpose, and something else must be found to take its place. As we pointed out only last month, the Japanese are "fed up" with this propaganda, and public opinion will rebel at any further

attempt to make their country the "policeman of China." Northcliffe is perhaps ignorant of the fact that on two occasions during the war when foreign lives and properties in North China were menaced by internal disorders, the Japanese minister was requested by his colleagues to have Japanese troops sent to China for police duty. That can never happen again. Hereafter, if the present temper of the Japanese people holds good, other powers will have the opportunity of demonstrating their real friendship for China by sending their own troops to protect their nationals and properties in the event intervention becomes necessary.

Suppose Northcliffe's question was answered in this wise; Japan is maintaining a huge army in order to be ready at a moment's warning to assume a humanitarian duty that the British, American or other foreign armies cannot be relied upon to perform. Remembering that in the past, the diplomatic corps at Peking when confronted with a grave crisis, has requested Japan to send troops to China to protect foreign lives and properties, and that present conditions in this country may lead to another such crisis, would Viscount Northcliffe care to place the facts squarely before the British public and tell them frankly that they must be prepared to send 100,000 or more troops to China in order to fully protect British interests? Or, would he, if the occasion arises, revert to his old platform and call upon the "Honorable Ally" to take over the burden of protecting British lives and properties in China? He could not consistently do this, so he would be compelled to tell the British public the truth, that the Japanese army will never be employed as a police force for the benefit of other foreigners in China. If China fails to put her house in order and invites intervention, and Japan adheres to the above policy, perhaps Northcliffe will explain to the British people just how much it will mean in military expenditure for the protection of their interests in China.

Northcliffe sounds the warning, "Watch Japan." Suppose the tables were turned and Japan controlled the greatest newspaper in the world, and asked the same questions about the British navy and warned its readers to "Watch England." Would he be willing to admit that Great Britain requires watching? Has not Great Britain been actively engaged while others were talking and consolidated her hold on the approaches to India, taking over Mesopatamia, emasculating Persia and bringing Hedjaz under her protecting wing? Has Great Britain relaxed in any way her grip on Tibet or overlooked any minor point in the great game of empire? Did Japan sound the warning, "Watch Britain," while she was so intently safeguarding her own interests against the day when Russia will resume her onward march? Why watch Japan, when she also is preparing against the same menace?

Is Japan Justified?

Is Japan justified in maintaining an effective army for defence? Who is to be the best judge of Japan's necessities? Who can fathom the exact meaning of the recent alliance entered into between Germany and Russia in open derision of the Genoa conference? Is not all this in line with policies already exposed, a confirmation of the statement made to Kenneth Roberts of the *Saturday Evening Post* year before last by the German commissioner of emigration? Siberia is to become the land of promise for Germany's millions, the Altai mountains the storehouse from which Russia and Germany will draw their supplies of iron, copper and gold that will enable them some time in the future to again re-open the conflict for world dominion. Is not every word of that frank statement of intentions being corroborated by events? Has not Mongolia once more passed under the control of a people's revolutionary government directed by Soviet advisers, the properties of foreigners confiscated, their business ruined and themselves compelled to flee from Urga? Does not everything point conclusively to the working out of a set program in this part of Asia, which once more must involve Japan in a life and death struggle because of the inability of China to perform her international duties?

Let us turn to the picture in Europe, where every sign points to another general outbreak as a result of the Russo-Germanic defiance of the allies, with France grimly determined to protect herself against the new menace. The significant speech of Clemenceau at Nantes was not needed to emphasize the gravity of the situation. Facing a new Russian offensive, Poland is caught between the jaws of the nutcracker. The collapse of Poland will be followed by the fall of the little entente, leaving France once more standing alone with her back to the wall facing this new coalition. Who can most effectively hold Russia in check; the British army or the battalions of the Mikado? In view of this crisis, pregnant with grave events, who has the right to challenge or question the reasons for the maintenance of a great army by Japan? Notwithstanding the opinions of Northcliffe, it is just possible that the Japanese are living up to the traditional spirit of the Samaurai, that obligates them in honor to stand by their allies and be ready at a moment's notice to assume their share of the burden in carrying out the pact of Versailles. No critic has the right to question the *bonâ-fides* of Japan at a moment, when the fate of Europe hangs in the balance.

Who Will Protect China's Integrity?

At a recent conference of Japanese admirals and other high officials at Tokyo, a resolution was adopted to the effect that every precaution must be taken by extending connections with neighboring regions to make sure of supplies, and thus, in the event of war, ensuring a drawn battle. *The Times* regards this as a serious symptom of misinterpretation of the Washington conference and believes it is the intention of Japan to develop economic relations with China, exploiting her resources in order to compensate for the restrictions imposed at Washington on the naval expansion of all the participants in the conference. In other words, Northcliffe again says, "Watch Japan." Why not watch the developments in Europe, in Central Asia, which compel Japan to be on her guard night and day against a forward movement of the Soviet? Who is to undertake the preservation of the *status quo* in Mongolia? Under no conditions will an American or British army ever be disembarked upon the shores of Eastern Asia for the purpose of preserving intact the integrity of China and giving effect to the principles underlying the consortium agreement which holds that Mongolia is a most important part of China. Who is to defend this fundamental principle of the powers interested in the preservation of the Chinese republic? If America, Great Britain or France cannot be relied upon to check the "menace from the direction of Urga," and impotent China cannot safeguard her own integrity, who then, is called upon by the highest law of self-preservation to step into the breach? Are we to believe that *The Times* now favors Russia having a free hand in Central Asia, making herself the overlord of Mongolia in order to carry out the self-confessed designs of Germany in these regions, and bring Russia once more into a position where she can attack Japan upon her exposed flank in South Manchuria? Is Japan to be emasculated in order that Russia may gain a position that menaces her very independence? Unless Northcliffe can give some better explanation than has yet appeared in *The Times*, it would appear that Japan is being held up to world odium, in order to divert attention from the activities of Russia and Germany. Northcliffe might explain to the British people just how they will protect India, once a German controlled Russia is firmly established in Mongolia. There may be some understanding that will relieve India from this pressure, but we reject this at once as wholly inconsistent with British sense of honor. With a full knowledge of the march of events in Central Asia, it is difficult to understand a change of policy which consigns a faithful ally to the scrap heap as soon as her usefulness is terminated. We can understand Northcliffe's sympathy with China and his campaign for the cancellation of the Anglo-Japanese alliance, but we cannot understand why it is being prolonged when every sign points to the time when Japan may again have to take active steps to defend her vital interests. Is Japan to be made the target of a new propaganda, while Russia and Germany are upheld in an alliance which cements the latter's hold on Siberia and hands Mongolia over to them both? If the

Japanese army is to be reduced with these events transpiring under our noses in Central Asia, who is to defend the integrity of China, who is to give effect to the consortium principles, who will counteract the pressure upon India, who will guarantee that Japan's vital interests will not be placed in jeopardy ? Let Northcliffe answer this question fairly, and the world will gather a better idea of the drift of his propaganda. This attempt to isolate Japan by turning world opinion against her and leaving her friendless in the event of a clash in Eastern Asia, has a deep significance, one which will not pass unnoticed by all fair-minded peoples and governments.

Northcliffe tells his readers to "remember the Twenty One Demands" which Japan attempted to force upon China while Great Britain was plunged in war and then goes on to enumerate them all over again, just after Japan has surrendered at Washington all that she gained through their imposition, with the sole exception of the lease to the Liaotung peninsula. What is the object of raking up these old demands in this fashion at this time ? To call attention to Japan's retention of Port Arthur and the Liaotung territory ? If this be so, then Northcliffe might read with considerable profit and enlightenment the reasons given by Mr. Balfour at the Washington conference for Great Britain's retention of the Kowloon lease. It ought to be a liberal education to him on fundamental Chinese problems.

Japan's Existence Imperilled

American editors have received a liberal education in world politics since 1914. They have learned to think for themselves. They may not as yet fully grasp all the intracacies of Asiatic politics and policies, but they are learning. From a mass of American editorial comment on the recent Russo-Germanic alliance, we select the following from the well-informed *Boston Transcript*:—

> "Not enough of the details of this alliance are known at this writing to warrant any attempt at an analysis of it, but it is quite plain that the signing of the agreement, over the heads of the inviting powers of the conference, will necessitate an entire readjustment, and a much closer adjustment, of the relations between the Western European powers—unless, indeed, Lloyd George himself is in the plot, and has made up his mind to throw France overboard for good and all for an understanding with Germans and Bolshevists. As such an explanation is untenable, it is clear that the original and main purpose of the conference itself—which was to unite all Europe for a stabilization of exchanges—is wrecked by the special arrangement now entered into between Germany and Russia."

If Northcliffe desires to create the impression that Britain has thrown over her old allies for some understanding with Germans and Bolshevists, he is going the right way about it. Fortunately, however, the world also understands something of the difference of opinion which estranges the owner of *The Times* and the premier of Great Britain, and makes allowances. The unreasoning anti-Japanese propaganda of *The Times* at this time can therefore only set others to pondering over signs and portents which lead to the suspicion that this sudden outbreak against Japan may conceal some new understanding, some new line-up, in which Germany, Russia and China are to be encouraged into forming a combination that will eventually eliminate Japan as a serious competitor in world trade by shutting off her raw supplies in neighboring regions on the mainland of Asia.

Japan made great sacrifices at Washington in order to dispel misconception about her policies. She accepted the dictum that her people may not overflow into lands pre-empted by the white races to expand in ; she acquiesced in a policy which prohibits her people from owning land in Manchuria and Mongolia in deference to Chinese ideas about their sovereign rights ; she accepts the verdict that there is no place in the world (except South America and some isles of the Pacific) where her people may emigrate to, and says in effect: "We accept your plan for the limitation of naval armaments, we forego our ideas of conquest and will keep our children at home and develop our place in the sun as an industrial nation and face you in the struggle for existence on an equal footing. All that we ask in return is that our near-by sources of raw materials, of food, and other necessities of life, be not barred to us. Our very existence as a nation, as a people depends upon this assurance." The world applauded and has given Japan her chance to work out her destiny along these lines. It means, if anything at all, that Japan must have fair-play in which to develop her industries and find her markets in open competition with other nations. Any policy tending to deprive her of near-by sources of raw materials and food, must, in the end, drive her to fight once more for the right to exist. And it is our honest opinion that any propaganda that helps to bring about such a conflict by encouraging a combination of Russia, Germany and China to shut her off from these sources of supplies in Mongolia or Manchuria by handing over these territories to Russian exploitation, will merit the execration of the civilized world. Instead of isolating Japan, when the true facts are understood, it will bring world opinion as solidly behind her as it was in her previous struggle for existence. Northcliffe overlooks this.

What would honest British opinion say if the Japanese started a counter campaign and harked back to the days of 1898 and invited the world to remember the British ultimatum to China ? Would honest Britons relish such muckraking of the old diplomacy in order to discredit them in the eyes of the Chinese ? Would Northcliffe wish to have British prestige in China impaired by constant harping on the fact that the most important British railway concessions in this country were obtained in the identical manner as Japan secured her advantages under the twenty-one demands ? Would he not have to admit that his own government was actuated by the same reasons which prompted Japan seventeen years later to apply similar remedies in self-defense ? The British government still enjoys the fruits of that ultimatum, while Japan has surrendered what she forced from China, with the sole exception of the Liaotung lease, and even here, she is willing to follow the lead of Great Britain and France if they will forego the similar leases to Kowloon and Kwangchowwan.

Would Northcliffe dare to come out openly in his great newspaper, and advocate a square deal for China in designing and operating her own national system of railways, that China be permitted to develop the port of Canton in her own way so it will serve as the deep water outlet for the Canton-Hankow and the other projected lines of South China ? Until he can do this with a clear conscience, his attacks upon Japan savor of smug hypocrisy.

Responsibility for China's Militarism

Why does Mr. David Fraser, the Peking correspondent of *The Times* (now at home) take up the hymn of hate and blame Japan for China's militarism, because of the Nishihara loans to the Anfu clique ? Japan, he says in a recent article in *The Times*, "is rightly charged with being largely responsible for the militarism that is now the curse of China."

Would Mr. Fraser care to go back a few years and tell the truth about the reorganization loan ? Others have told it. That loan provided Yuan Shih-kai with the millions which turned him into a military despot, enabled him to build up the huge army in the North and create a military oligarchy which was employed to crush the growing germ of democracy in the South. Who placed the yoke of militarism upon China ? Who created the vampire oligarchy which in an unbroken line since Yuan, has fastened its claws upon China and sucked its life blood dry ? Yuan, Feng, Tuan, Chin, Hsu and now Wang, all the old gang of Peiyang militarists have held the reins of power by reason of their having been companions of a despot who broke the back of the republican movement in China through a loan that was not raised in Japan.

And let us be fair to those who forced through the re-organization loan against the repeated appeals of the South and go back, a few years more to 1909, when the new militarism was born in China through the imperial army program calling for 36 divisions (exclusive of the imperial guards of 30,000 men) of which eight were allocated to Peking and the metropolitan province, and,

with the exception of the guards, under the direct command of Yuan Shih-kai. There was no talk at that time of Japan being responsible for this new departure, in fact, it was hailed as a sign of progress with all European powers intensely interested in a movement which provided unusual opportunities for the sale of arms, munitions, equipment and machinery for arsenals. At that time Japan was not a serious competitor in this field of modern industry. The impetus towards militarism came from an entirely different quarter, with Germany getting the lion's share of the orders for army equipment and Great Britain bagging the plums for the new navy. There was no criticism at that time about any one nation being responsible for China's new militarism, only the squabbles as to who would obtain the orders. Japan was not one of the squabblers.

Outside of Li Yuan-hung, from Chang Piao's southern army, and Chang Tso-lin, the bandit of Manchuria, the oligarchy of Peiyang generals (followers and sworn brothers of Yuan), have reigned supreme either directly or indirectly through their puppets. The power of the old Peiyang group has never been broken and when Yuan became dictator and was furnished funds from abroad which cemented his position, it became impossible to pry loose their hold on the nation. Japan was not responsible for the growth of the power of this clique. The responsibility rests squarely upon the shoulders of whoever was directly responsible for ignoring the protests of the Kuomintang and supplying Yuan Shih-kai with the 25,000,000 pounds sterling which enabled them to solidify their position, hound the parliamentarians out of Peking and give the *coup de grace* to the republican movement.

True, it is, that Japan loaned the millions during the war which enabled this flock of vampires to fatten themselves upon a helpless people, but it was not Japan who created and made the situation possible. Would Mr. David Fraser have us believe that as long as the British government favored and supported the military despotism of Yuan that the world should applaud, but when Japan carried on during the war and loaned the funds so the system might be perpetuated, that she is to be held up to the bar of world opinion as solely responsible for the present situation? Japan may have been responsible for prolonging the system, but she did not create it. Why, then, pick on Japan?

The Story of "The Two Japans"

Northcliffe continues to harp on the threadbare story of the "Two Japans," in which the militarists are censured for their failure to live up to treaties entered into by the responsible government. This story has served its purpose in the same manner as it was employed to turn world opinion against Germany. The Japanese have been quick to sense where all this hostile propaganda was leading the nation. Sure, there are two Japans, as there are two Americas, a double-faced Britain and a Jeckyl and Hyde France, which takes the form of a constant conflict of opinions between the civil and military authorities in order to hold the reins of power, wherever an army of occupation in a conquered or occupied country in essential to stability. It is superfluous to cite incidents in support of this statement.

In this respect there are two Britains, and in like manner we have two distinct cleavages in present-day France, where for the moment the military are on top dictating the policy of the government. In America, in Great Britain, in France, as elsewhere, the militarists justify their flouting of the civil power on the high grounds that national or imperial defense imposes this duty upon them, that the civil authorities have no conception of how to treat subject peoples who accept all concessions as a confession of weakness. And here they differ in no respect from the Japanese militarists who insist that had they relaxed their vigilance and handed over full control of the government to the cabinet, the nation would have fallen a prey to some stronger predatory power.

It is correct to say that there have been two Japans; it may be that the power of the militarists still endures, but it is also a fact patent to all impartial observers, that the Japanese militarists have had their day and from now on the policy of the government will be dictated by the business element. It certainly will not strengthen their hands or forward the cause of liberalism in Japan to start anew a propaganda against the militarists. If Japan is to fall into line with the nations of the West, her liberals must receive support, sympathy and encouragement. To reopen a dead issue, in order to discredit their nation and hamper its legitimate trade aspirations is certainly not conducive to amicable relations or harmonious co-operation. Give the liberals and business-men of Japan their chance. They can be depended upon to put their militarists in their proper place if not nagged and ragged by unfriendly foreign criticism. To those who persist in holding up the picture of the "Two Japans" as proof of the existence of a dual government in that empire, it might be well if they read more carefully the current history of other nations. They would perhaps become convinced that they themselves were dwelling in very conspicuous glass houses. Why throw stones at Japan?

Japanese Propaganda

Northcliffe then comes back to the worn out fable about Japanese propaganda and says:

> "When calling attention to any matter that affects Japan we have always to remember that hourly, daily, weekly—morning, noon, and night—Japanese propaganda is at work in the form of bribed newspapers, propaganda news agencies, propaganda plays and propaganda films, and that quite a considerable amount of this propaganda has been widely diffused in Great Britain and the United States."
>
> "The controller of a Far Eastern news agency said to me: "I had some experience of the German propaganda before the war, but the Germans are infants in arms in comparison with the Japanese." That was also my own personal experience."

This makes most interesting reading. Now let us analyze it and keep in mind other pertinent facts. Northcliffe concurs that in the matter of propaganda the Germans are infants in arms in comparison with the Japanese. That is a tall statement. During the war the allies got together and expended many millions ($12,000,000 by America alone) to counteract the German propaganda. They succeeded. The Germans afterwards very frankly admitted that their *moralé* was broken and allied victory made possible because the latter outdid them in publicity methods. Again, unless our memory plays us false, the Germans also very candidly admitted that the British publicity system was the most effective. At the head of Britain's publicity organization stood the owner of *The Times*. If this be true, then Foch, Pershing, Haig and Diaz are overshadowed by the real hero of the war, the master mind of British propaganda, Viscount Northcliffe.

Yet here we have the king of British propaganda handing over his crown and scepter to some obscure person in Japan. Now, it stands to reason that wherever organized propaganda exists there must be some directing genius, who sounds the key-note for the agents of the system to work to. Yet Viscount Northcliffe fails to enlighten his readers as to the identity of this personage. Who is the master-mind that directs this brilliant Japanese propaganda? He certainly is not British. Neither is he American. No editor of a foreign newspaper in Japan can lay claim to this honor which places him head and shoulders above Northcliffe. Who, then amongst the Japanese, has risen to a height where he outshines Hearst in America and Northcliffe in England?

The time has arrived when the world demands something more than mere inuendo. What are the names of the bribed newspapers, the propaganda news agencies, the paid writers of the system which menaces the prestige of Northcliffe and his own organization? Come out into the open, talk facts and give the Japanese a chance to defend themselves. It is easy enough to be a successful propagandist and sway the opinion of the English-speaking world when one owns the most important daily papers in the world. It is easy enough to damn a nation and a people, when they cannot answer back, when they have no press or mediums through which to present their views to the same audience.

There was some explanation to be found for the recent anti-Japanese campaign conducted by Americans; there is no good or sufficient reason to account for Northcliffe's outburst against Japan. Knowing that Japan cannot reply in her own press and has no way to make her voice heard throughout the English-speaking world, it is our candid opinion that Viscount Northcliffe is taking an unfair advantage of a people staggering under a great handicap. It is contrary to all ethics of the game, to that spirit of fairplay and sportsmanship inherent in the British character to jump on Japan at a time when her liberal element is striving to fall into line with the ideals of the West. Japan is entitled to have her side of the case placed before the world, she is entitled to more consideration in this respect that any other large nation because of her inability to properly defend herself against these attacks, and she deserves special courtesies and advantages from the press of an ally whose highest officials bear cheerful testimony to her willingness to shoulder her full obligations during the late war.

There is another side to the story that Northcliffe tries to impress upon his readers. If there exists a propaganda in Japan, we have failed to discover it. The only Japanese propaganda we have been able to locate in fifteen years, is one which has for its object: peace, co-operation, harmony and understanding between Japan and the United States.

Why Kick a Dead Horse?

It is not difficult to understand the trend of Northcliffe's propaganda. It is also easy to understand that it is his own fight; that he does not faithfully reflect the views of his government, or the bulk of British opinion. Northcliffe is probably accurately informed that public opinion in the United States is satiated with this persistent and unreasonable campaign to incite national hatreds, racial antipathies and provoke trouble. American opinion is aroused as it never was before. Our leading statesmen are openly advocating that the purveyors of false news be deprived of their citizenship, and it is not at all improbable that an official investigation will be made to probe into these movements and discover their real instigators.

In the welter of Far Eastern propaganda and the keen struggle to dominate the Chinese government and influence business for contending nationalities, it is sometimes difficult to speak for a whole community. But we can safely state on behalf of the entire international commercial community in Shanghai that the continuance of propaganda of the character now sponsored by Viscount Northcliffe can bring no permanent or beneficial results to those who must seek their future in this country. Business in China calls loudly for a respite from these acute campaigns directed against friendly nations. We need peace, harmony, co-operation and consideration for the other fellow's problems and troubles. We are all in the same boat in China. There is no nation entitled to accuse another of taking advantage of China, for the purpose of ingratiating itself with the Chinese. The Japanese may sport no halo, but there exists no empty pedestal erected to the savior of China, that any nation has the right to preempt. The line with bricks now forming behind Northcliffe and his lieutenants for throwing at Japan might be better employing in erecting an enduring edifice of international good-will.

The world will probably heed the warning of Northcliffe, and Watch Japan, but it will also Watch Northcliffe, and scan very closely the propaganda that is simply a revamp of old stuff that was forgotten at Washington. Why kick a dead horse, Northcliffe?

The Soviet's Holy War Against Britain

We invite attention to a little book just published by the Macmillan Company, entitled *"Russia in the Far East"* from the (r of Leo Paslovsky. In this book we read as follows:

At the third international congress held at Baku in September, 1920, Zinoviev laid down the most important of the fundamental theses of the whole policy and program of communism in Asia. In his own words this policy is: "We are ready to support any revolutionary struggle against Great Britain . . ." The watchword under which this struggle was to be carried on was presented by him to the congress in the following form: "Declare a holy war against European imperialism, particularly against Great Britain."

Has Zinoviev's campaign progressed in the past eighteen months? Let British interests in China answer this for themselves. The facts should warn Northcliffe and his advisers that in denouncing Japan and playing hand in glove with Bolshevist agents, instead of enhancing British prestige in China they are acting as the pliant tools of a system whose ultimate object is the overthrow of British dominion in Asia.

This interesting and timely book also very tritely explains the Soviet policy towards China and Mongolia, making quite clear that while Russian propaganda is directed against Japan's continued occupation of Eastern Siberia, the Soviet is steadily absorbing the vast territory of Mongolia, doing unto China exactly what they bitterly denounce in Japan.

Bringing Japan and America Together

The opinions expressed by a section of the British press testifies to the adoption of an extreme pro-German policy and we find the *Manchester Guardian* jubilant over the cooling of British sympathy for Japan. This influences the *Tokyo Nichi Nichi* to remark:

> "To rely on a country in case of need and put a slight on it when its help is not necessary has, it seems, become the common-place thing in the world's diplomatic circles. We cannot, of course, foretell how long the intimate relations between the United States and Great Britain will continue. But there is no knowing whether the two countries will not meet with the same experience as Great Britain and Japan has had since the severing of the bond of alliance.
>
> "Perhaps history will repeat itself in the case of the Anglo-American friendship. Be that as it may, the preposterous sacrifices and concessions made by Japan have furnished the United States and Britain with unexpectedly great successes and satisfaction, diplomatically and strategically. In other words, what has cost Japan so dearly has promoted the friendship between the United States and Great Britain and dampened the cordial sentiments of the British people for Japan. What little Japan has gained at the conference is the establishment of good understanding between her and the United States. If the peace of the Pacific be preserved and maintained by the two countries, their friendliness and amity will grow more and more in the future.
>
> "And, in the sense, Japan and the United States will come to be bound together either spiritually or materially and contribute immensely to the safeguarding of world peace and elevation of the status of human civilization and culture. The Japanese people who have been disappointed at the results of the conference had better entertain optimism for their future in the face of these fine and rosy prospects."

The *Nichi Nichi* is right. The picture painted by Northcliffe bears the imprint of a system familiar to impartial observers in this part of the world. America and Great Britain will remain close friends and allies, exerting their great influence and power for world peace and uplift. Japan has been brought into this new understanding for the preservation of our common policies in Eastern Asia. She will not fail her partners. Despite the vigorous campaign of Northcliffe for the abrogation of the Anglo-Japanese alliance, the British government lived up to the highest ideals of international honor in refusing to throw over Japan and isolate her until another satisfactory understanding was arrived at to take its place. Any attempt at this time to prolong the agitation against Japan will only defeat its object. The continuance of such an unwarranted and untimely campaign will tend to draw America and Japan closer together in a more perfect understanding. The "King of Propaganda" should realize this.

GEO. BRONSON REA.

River Conservancy in China

AN ANALYSIS OF COSTS

By Laurence Impey, C.E., A.M.I.M. & County Engrs.

THOSE who read my article on River Conservancy Work in the May number of THE FAR EASTERN REVIEW may perhaps be interested in a more detailed account of the work, together with some estimates as to costs.

The map appended shows one of the most dangerous stretches of dyke on the whole of the Han River, in my opinion, and I have had an opportunity of observing the work at the other places up and down stream fairly recently.

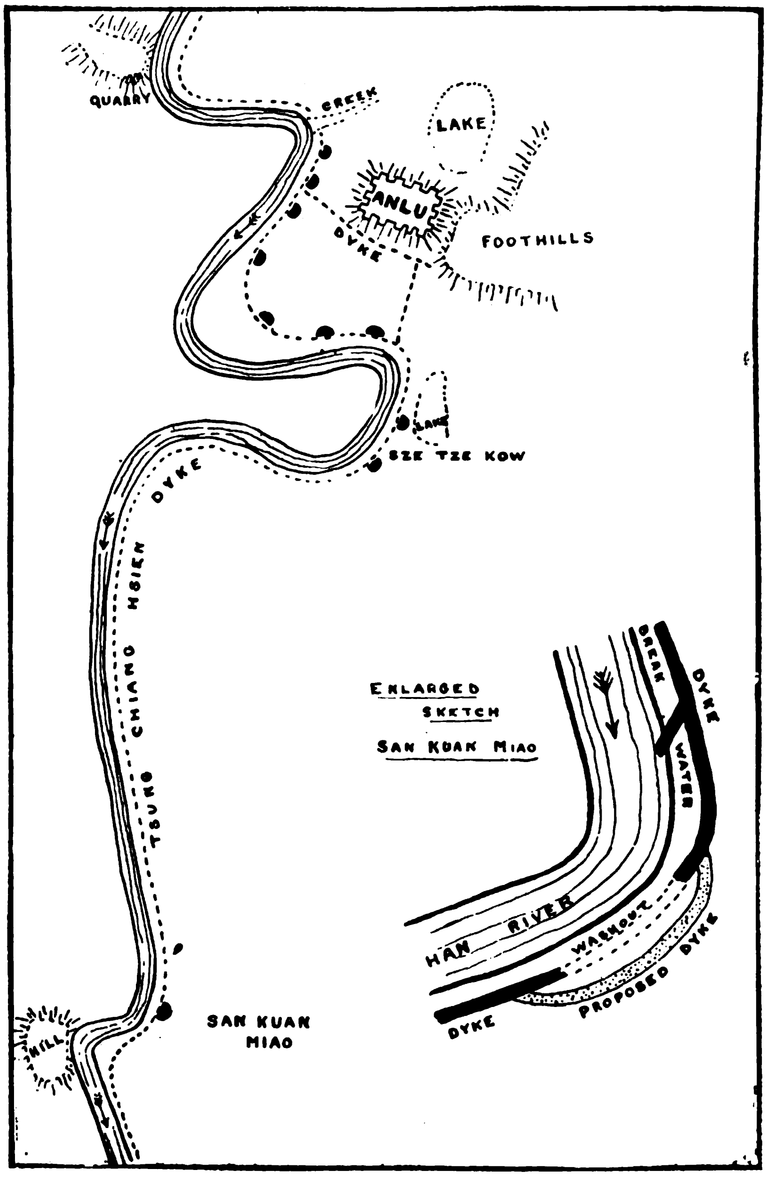
The figures I shall give will be taken from the work at Sze Tze Kow more particularly, as I can cost the accounts there more readily, and the work has a resident engineer, not being under a Chinese of the old regimé as it is at San Kuan Miao.

The total distance covered by the map, from the quarry above Anlu down to San Kuan Miao is divided as follows: Quarry to Anlufu, 5 miles, Anlufu to Sze Tze Kow, 10 miles, Sze Tze Kow to San Kuan Miao, 20 miles, a total distance of 35 miles.

It must be remembered that the quarry on the map is not the one from whence the stone for the work is obtained, that comes from a hill 14 miles further on.

The reason for the disuse of the first quarry is, I think, to be found in the old Chinese superstition anent "*feng shui*," as underneath the hill is reputed to lie coiled a dragon which it were disastrous to disturb, and therefore some perfectly good stone is wasted, and the cost of the work considerably increased.

This hill, however, plays an important part in the formation of the course of the river, as it diverts the current at right angles and sends it crashing down upon the dyke just north of Anlufu, with results that are easily imagined.



Han River Conservancy: Anlu-Sze Tse Kow-San Kuan Miao Dyke Works

The dyke was broken in over twenty places last year, between Anlu and Sze Tze Kow, and only the secondary dyke shown on the map saved a great disaster.

As it was, the water inundated the area north of the city until it was held in check by the high ground and walls of the city on the one hand, and the foothills on the other.

A lake and a creek are the only souvenirs, now that the flood has receded, for the gaps in the dyke are practically all repaired now, mostly by local endeavor, together with a grant from the famine relief committee.

Formerly the river ran below the walls of the city of Anlu itself, but for various reasons it has receded year by year, until at present it is no less than eight *li* (nearly three miles) away.

It is noticeable that all the breaks occur at the end of a stretch of water, where a sharp bend in the course of the river causes it to exert enormous pressure against the dyke at such a spot; and I think I am safe in saying that this has proved the rule over the whole distance of three hundred miles from Anlufu to Hankow.

As fast as the river wears away one bank, it accumulates sand on the other, thus silting up the old channel, a state of things that only a dredger could remedy.

In passing, I would mention one curious phenomena which we have just observed, which is that whenever the freshets from the hills cause the river level to rise the sand bars seem to rise also, with the result that our steamer gets practically no advantage from a rise in water level of perhaps eighteen inches.

I dealt last time with the emergency methods which we were employing to repair the dyke, and I would call your attention to the custom of old time as exemplified in the work done by the Chinese at San Kuan Miao this year.

The break, as illustrated in the rough sketch, may be said to have been caused by a combination of circumstances.

Firstly, you have the rush of a large volume of water bearing down on the dyke with a direct impact which it is not sufficiently well protected to withstand.

Secondly, there has been constructed a breakwater, some hundred yards above the washout, with the result that a dangerous eddy was formed, which probably did more damage in undermining the toe of the dyke than did the direct impact itself.

Within the break the new dyke, called by the Chinese a "*yueh tee*," has been built, a method which they seem invariably

to adopt, but which would not commend itself to engineering practice elsewhere.

It is certainly much cheaper and easier to build in every way, the other method requiring good foundations and piling, together with rock facing ; but while one results in keeping the course of the river as clear and straight as possible, the other involves it more and more for every fresh break.

I am not able to quote any Chinese conservancy accounts from first hand auditing, but I append below the expenditures at Sze Tze Kow and other places under the famine relief commission roughly analysed.

Expenditures.	Per cent of Cost.	Notes.
Piles	20.8	ex Hankow.
Wire	.8	" "
Rock	23.3	ex Quarry.
Earth	25.0	
Sand	16.6	
Salaries and wages	4.2	Engineers, Accounts, Foremen.
Extra labor ..	.9	
Pile driving ..	3.4	
Bamboos	4.2	
Sandbags	.4	
Expenses, overhead	.4	
	100.0	

I purpose to give a few particulars as to the various items, the sources and application, together with data as to employment of labor, and comparison with previous Chinese work would be very informing if the material were available.

The piles used on the work were shipped up from Hankow by junk, and cost Tiao 5.0 apiece delivered on the job.

They average thirty feet, and are cut for twenty-two-foot piles, or twenty-five-foot piles, the surplus timber being used for the five-foot base piles, the cost of cutting being borne by the contractor, and to be covered by the price of driving.

Driving of piles is paid per foot of penetration, the average cost per pile working out at 850 cash.

The driving of the small base piles and the wiring to the main piles costs 120 cash per set of two main piles and one base pile, with forth-five feet of wire.

Two methods of driving are employed, the usual one with a driver and iron monkey, the other, a sort of frame placed on the pile itself, on which the driving crew balance themselves, and the pile being pounded into place with a stone rammer.

The rock used is sandstone, no other being obtainable unfortunately, and has to be brought down stream in boats, some difficulty being caused owing to the fact that the boatmen all want to avoid this class of work, and have to be drafted by the district magistrate.

The price is contracted to include transportation, and is Tiao 7.0 per *fong*, measured on the job.

An interesting sidelight is thrown on the prices on previous work in this area by the comments of various contractors after a week's work.

Several of them came and complained that they were losing money, the prices being lower than those quoted above, and when I objected that the contract fixed a price, they replied that on the government jobs they had supplied, say, eight *fong* of rock, and been paid for ten ; or driven a pile five feet and been paid for eight, and cutoff the rest of the timber.

Earthwork was contracted on the same principles, the surplus being presumably divided between the contractor, the foremen, and the official in charge of the work.

Earth is costing about Tiao 3.0 per *fong*, and sand Tiao 2.0 per *fong*, the earth being brought in boats chiefly, and the sand carried in baskets and barrows.

Men, women and children are employed by the contractor, who uses a system of bamboo slips issued by his foremen for each load, and which are redeemable at the end of the day.

The price per load varies according to distance, from five cash to 15 cash being usual, and about 140 loads being carried to one *fong*, enabling a good worker to make 500 to 600 cash a day.

On the government work below men who are leaving tell me they could only make 200 to 300 cash per day.

Tamping and placing of earth is done by the contractor, in fact there is very little outlay on labor outside the ordinary contracts, some few coolies being used to place rock, and a few for extra wiring.

Bamboos are bought locally, and cost about 200 cash apiece, being bought by weight.

They are split into two or three pieces for weaving purposes, this costing 30 cash apiece, including splitting and placing, together with fastening down.

The Chinese system in the past has been to use bundles of reeds, but these rot very rapidly, though it remains to be seen how long the bamboos will withstand the wet either.

Sandbags have been purchased in large quantities, filled, and laid on the reverse of the dyke at the threatened points, in case the work does not progress sufficiently rapidly to enable it to be completed before the high water comes this year.

It must be remembered that the work has to be done with local labor, and that these men are farmers for the most part, who have to attend to their crops and planting at certain definite seasons, therefore it is very difficult to estimate on the amount of work that can be done in a given time.

The wages bill is small, as there work is contract work, and only four or five foremen and a storekeeper are necessary.

A Chinese accountant, a Chinese engineer, a foreigner supervising both, and the force is complete, with the exception of cooks and servants, a very minor item.

Money has to be brought up from Hankow periodically, so that the cost of a launch bearing money and supplies should be divided amongst the four or five jobs it serves.

It must be recognized that this is an emergency proposition, managed by amateurs, working against time, without proper preparation and the fore-thought necessary to the execution of such a project, and that it is also primarily intended as a famine relief measure, so that the usual surveys and engineering calculations are not available.

If this is remembered I hope and believe that some of the data may prove both useful and interesting.

New Harbor at Takoradi, Africa

The engineers responsible for the construction of the new harbor at Takoradi, Africa, have to face remarkably heavy excavations in rock, and to successfully undertake this work the use of mechanical excavators, of such rugged construction that they are capable of giving reliable and efficient service under very severe conditions, is essential.

It is eloquent testimony of British engineering that Ruston & Hornsby, Ltd., of Lincoln, have, in face of world competition, been instructed by the Crown agents for the colonies to supply three exceptionally heavy railway-type steam shovels to carry out the necessary excavations on this scheme.

These shovels are larger than any hitherto constructed in this country, the net weight of each being approximately 100 tons, bucket capacity $3\frac{1}{2}$ cubic yards, a full bucket representing 8 tons of rock.

Szechuan Developments

THE following is the scheme for a railway project by Gen. Yang Sen, which has been handed by him to foreign Consuls at Chungking.

I. Railway

(1) *Chungking-Chengtu.*—As a first step towards encouraging the development of China's largest and most wealthy province and with a view to providing sufficient employment for the people, and extending trade and commerce generally, all of which tend to the maintenance of peace, and to an adequate supply of the raw materials now required by the world, the Szechuan government proposes to construct a railway—in the famous Red Basin—from Chungking to Chengtu (about 300 miles) with a view to a future extension to Tachienlu, the gateway of Tibet, the world-famous treasury—about another 250 miles.

(2) *Gauge.*—In view of the fact that the cost of constructing a standard gauge railway over a hill country like Szechuan would be very great, it is proposed to build a narrow gauge line, say 1 metre, something similar to the lines laid down in Shanshi. This and other technical points are, of course, questions for decision by experts when the time comes, and need not, therefore, enter largely into an outline proposal such as this.

(3) *Probable Cost.*—At this initial stage it is also impossible to form an exact estimate of the probable cost of such a railway ; but for the sake of negotiating a loan the figure may be temporarily put down at from twenty-five to thirty million taels. The final figure, however, to be settled when estimates have been prepared by experts.

Loan.—The terms and conditions of the proposed loan to be discussed when, and if the loan is negotiable, in the name of the Szechuan provincial government.

(4) *Traffic and Present Freight Costs.*—Traffic along the proposed route is enormous, and the amount of freight which the Szechuan people have already shown their willingness and ability to pay is probably higher than that prevailing in any part of the world. As an instance of this the steamer freights from Ichang to Chungking (about 500 miles) may be cited. The cost of freight over this 500 miles works out at from Tls. 70 to Tls. 100 per ton.

Again, the overland transportation charges of cargo from Chungking to Chengtu are, at present, about Tls. 130 per ton (about 40 tael cents per ton per mile) and the transportation by river between these two places is roughly about Taels 15 per ton, the cargo being six weeks *en route*, and often arriving damaged by water owing to frequent wrecks. From these figures, therefore, it is safe to estimate the railway freight charges for the entire journey, Chungking to Chengtu and *vice versâ*, at about Taels 20 per ton, or about six tael cents per ton per mile.

(5) *Possible Revenue.*—In considering the possible revenue to be derived from such a railway as is proposed, the development of the coal, salt, rice and sugar industries must be taken into account, as well as the immense traveling population, which would always insure a heavy passenger traffic. With peace once restored to the province there would at once be a general increase of native exports and foreign imports. Besides all this the railway itself would naturally lead to the development of many new industries which would all tend to increase the income of the railway.

It would seem, therefore, safe to estimate the capacity of the railway at about 3,000 tons per day. This would be equivalent to 12 trains per day of 250 tons loads (passenger and goods combined, also the intermediate traffic included in the calculation) up and down the whole length of the line. Thus reckoned the tonnage per annum would reach the million mark, yielding a revenue of 20,000,000 taels. Even, therefore, from such a cursory glance, it will be seen that a railway between Chungking and Chengtu would prove to be a most profitable concern.

II. Coal Mines

It is becoming clear, even to the ordinary man in Szechuan that no real development can take place in the province unless an abundant supply of cheap coal can be assured. Coal is the key to the success of any and every enterprise ; without it no modern industry can be made successful.

Realizing this to be a fundamental truth, it is proposed that together with the construction of the railway there shall be started an official mining department whose aim shall be to develop the coal mines along the line on modern lines and methods. The said mining department is to be combined with the railway in a similar way as that which prevails in the case of the South Manchuria Company.

For this department the government proposes to raise a loan of one million taels.

The prospects for such a coal mining concern can hardly be exaggerated, and the advantages are obviously manifold :—

(1) The railway itself cannot be run without coal, and it would be a short-sighted policy to build any railway without first making sure of the coal supply.

(2) The ever-increasing fleet of high power steamers plying on the Upper Yangtze are such enormous consumers of coal that already it is being realized that the old-fashioned methods of producing coal are incapable of meeting the great demand of the Upper Yangtze steamer companies.

(3) The development of coal mines will greatly augment the traffic on the railway, and will always prove a sure source of revenue.

(4) With the introduction of railway transportation facilities the price of coal can be considerably reduced.

The extent of this reduction can be appreciated by a consideration of the fact that now from 70 per cent. to 80 per cent. of the price is absorbed by the present antiquated methods of transportation. It is self-evident, therefore, that with modern methods of production sales will greatly extend. The comforts of the people would rapidly increase, and every household in Szechuan would soon be a consumer of coal. The fact that, in an immense territory like Szechuan with a population of 70,000,000, there is not a single modern equipped coal mine, is sufficient to prove the success of such a mining department as the government proposes.

(5) The development of the coal mines along the line of railway would speedily result in the establishment of many industries equipped with modern machinery such as :—

Sugar refineries, textile manufactories, cement works, salt refinery, indigo works, flour, oil and rice mills, extension of silk filatures, woolen factories, paper-making factories, glass-making factories, tanneries, brick and lime kilns, hydraulic stations, electric light, waterworks, etc. etc.

for all of which factories the Szechuan province is able to provide the necessary resources. With such a railway once running and all these industries established Szechuan would be on the way towards being one of the richest countries of the world.

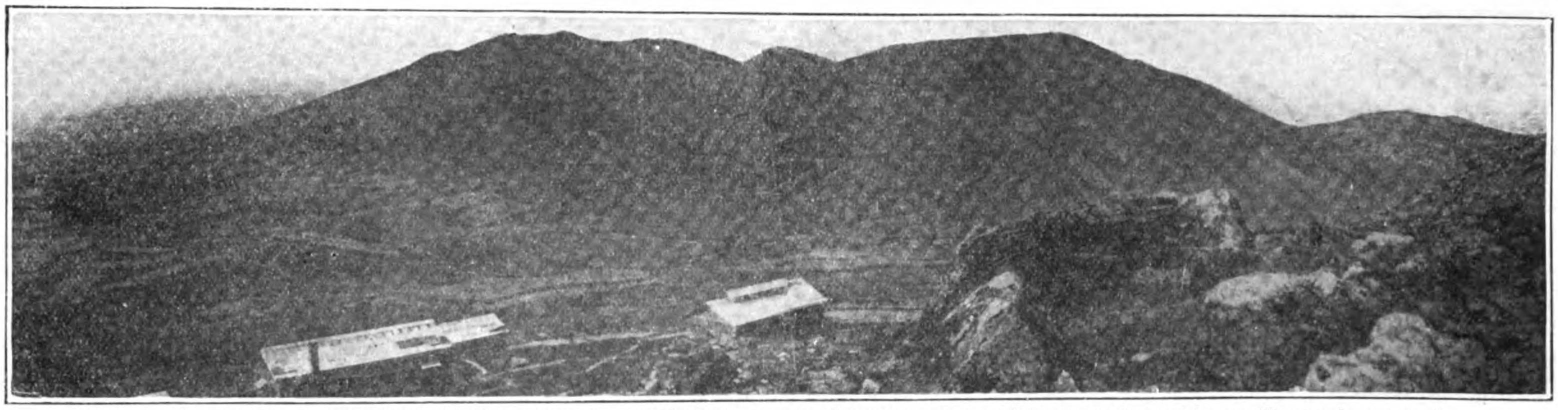
(6) The coal mines and the railway together with the consequent industries which will naturally follow, will more than supply work for the transportation laborers who may be affected by the introduction of the railway.

(7) Once the coal mines are well established other mines, such as iron, copper, silver, gold, mica, asbestos, antimony, mineral oil and spelter would soon follow for Szechuan possesses all these materials in great abundance.

(8) A daily output from the beginning of 1,500 tons of coal would mean half a million tons in the year. On this the profit realized would amount to Taels 750,000 calculating the profit at Taels 1.50 per ton. It is obvious, therefore, that the development and prosperity of Szechuan depends more upon coal than almost any other article.

The An-shan Iron Mine District, South Manchuria

By Hanzo Murakami, Geologist to the S.M.R. Co.



View showing the contact between the green schist and quartzite; the hematite-quartz-schist is not found there (Hsi-an-shan mine)

1. History of the Iron Ore Industry

THE Russians, when laying the railway from Harbin to Dalny (Port Arthur) had no inkling of the An-shan iron belt, in spite of the fact that the railway track crosses the middle of it, and on account of the low grade of "the iron-containing rock," they used it only for railway ballast.

In the year 1909, the geological survey conducted by the South Manchuria Railway Co. established the true value of iron ore at Tieh-shi-shan, literally meaning "the mountain of ironstone." Generally, the Chinese geographical names tell something about the geological peculiarity of the place. After the discovery of Tieh-shi-shan, this company continued to explore the district more and more, and had a delightful surprise at discovering the wonderful distribution of the iron; and now a fairly definite idea of the general distribution of the ore is known. This iron wealth lay neglected for a few years, partly because of the difficulty of acquiring the necessary concessions and partly because of the low economic value of the ore. During the war, the necessity for a local of iron in Japan was strongly recognized, and by May, 1919, two blast furnaces, with a capacity for 250 tons a day each, were completed in An-shan.

Map showing the location of the iron mine district of An-shan, South Manchuria. Shaded area indicates the iron district

When mining was started, it was astonishing to find many openings which no doubt once served as pits, excavated by primitive methods having a depth of about 60-ft. from the surface. Evidently this ore was mined in ancient times. It seems that the above depth was probably the maximum attainable, on account of the occurrence of water, bad ventilation, etc., when gunpowder or other modern devices were not available. Moreover, many pieces of old slag with charcoal and bones of mammals, employed for smelting purposes, were found.

From "The History of the Liao Dynasty, Vol. 60," written in Chinese, one may infer that the primitive mining above mentioned dates back about a thousand years, and that Tai-tsu, the founder of the Liao dynasty, took no little interest in mining work, especially in iron smelting, in the years 616-721, or in the Shen-tse era. It is recorded also that there was, at that time, a tax collector's office for levying taxes on the iron work at Liao-yang, 15 miles north of An-shan, known by the name of Tung-ching and that the tax was paid in iron produced.

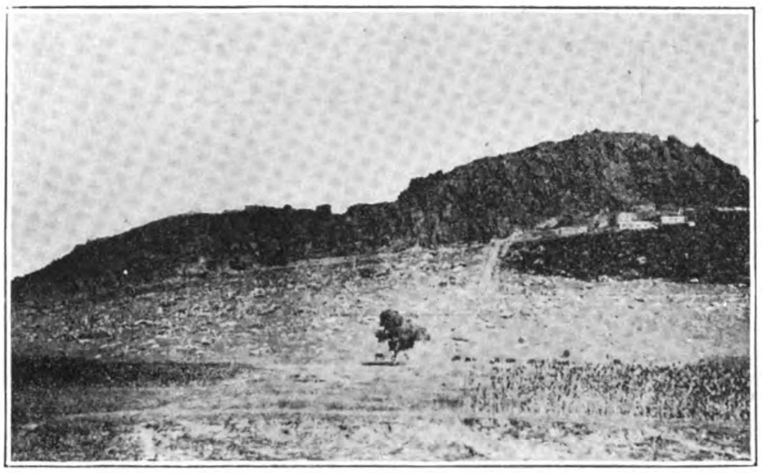
In this connection, on Shou-shan, 9 miles north of An-shan, popularly referred to by the natives as Shou-shan, because the Chinese character has the same pronunciation, a blast furnace was constructed, surrounded with about 300 houses for the residence of those engaged in smelting and mining industries. From these data, we may gather that the mining in the vicinity of An-shan was very prosperous in ancient times.

II Topography

Any traveler who is going to Dairen southward from Mukden will find that the eastern side of the railway is a mountainous region, while the western side is an extensive plain with no remarkable mountains or hills. This is the reason why the railway runs along the great tectonic line through South Manchuria trending NE-SW, and the plain on the western part is the effect of the depression along the great fault and includes a wide lowland, through which the great river Liao runs. In the An-shan district, however, there are some traces of erosion relics even on the western side of the railway, though they are not remarkable when compared with the mountainous area in the eastern part of this district.

The geology of the An-shan district is comparatively old, because we cannot find any sedimentary or igneous rocks younger than the Cambrian. The crust has undergone severe denudation in the course of long ages. The present topography of the An-shan district has resulted, to a very large extent, from the differential erosion of rock formations, which offer varying resistance to the processes of degradation (Plate 1). The ridges, generally, tend to be flat-topped, and separating the various valleys from one another, they remain now the plateau of erosion or relic mountains. These uplands stand on the quaternary lowland just like an island in a great ocean.

Such a recent deposition as the glacial drift of the Lake Superior district in the United States of America, to which I have already



1. Typical view, showing differential erosion. The rock forming the cliff is the hard hematite-quartz-schist; while the slope is the soft green schist. The boundary between these two rocks is seen by a line in the figure.

2. Panoramic view of Chien-shan granite, taken from a detached hill, 6 kilometres to the west.
The characteristic features in the foreground can be easily distinguished from the formations of the range in the distance

alluded, cannot be found in the An-shan district, but we find some deposits of loess of æolian origin as the counterpart of the drift.

The exposures of the several formations are very distinct owing to the steep dips of the strata and the sparseness of the vegetation. This is very convenient, for field work and underground methods such as boring, are not required. The reason of the scarcity of vegetation in Manchuria is the ruthless deforesting and negligence in replanting rather than the aridness of the district: the precipitation in the year 1919 amounted to 429.5mm. in Dairen and 615.5mm. at Mukden.

The topography of the mountains can be classified into the four following types according to the structure of the rocks:—

(1) Chien-shan granites are distributed over the southern end of the district and develop abundantly in this direction, as may be seen on the map. They form, in general, erosion relics, the surface of which is more or less irregular, zigzag, ribbed and knotted. The height of the Chien-shan granites is estimated at about 550-600 metres above the level of the plain. The beautiful scenery of Chien-shan (Plate 2), commanding a view of the surrounding lowland of the Liao plain, was an object of veneration by the vatives from time immemorial, just like Mount Kongo (Diamond Mountain) in Korea.

(2) Hard and durable rocks, such as the hematite-quartz-schist and quartzite, stand out as mountains because of their persistence after erosion and denudation; the strike of the strata coincides more or less closely with that of the range. As seen on the geological map in this paper, these durable rocks are arranged so as to make a right-angled triangle with the railway as one of its sides; the average height of these mountains is about 200 metres above the plain.

(3) The gneissose granites rise to a height of over 200 metres. The distinction between the Chien-shan granite and the gneissose granite is that the ridges of the latter are flat-topped, being transformed into the undulating uplands. A study of such a plateau suggests to us that a chain of original mountains, after it has suffered much denudation, may afterwards again be uplifted to such a height as before (Plate 3).

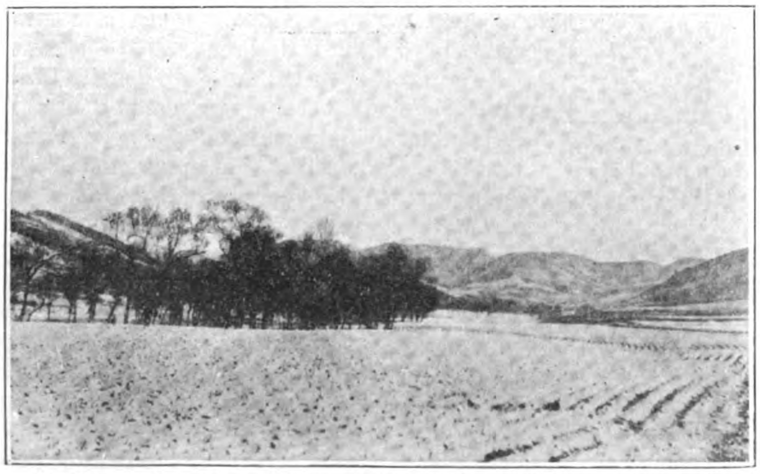
(4) In the course of long ages, the plateaus of granite pegmatite and other related rocks have suffered extensive denudation. They have been trenched and furrowed by many valleys to such a degree that they are hardly recognizable as table lands; their original plain-like character being nearly lost. They are transformed into regular ranges or irregular groups and masses of relic mountains. So the distribution and relation have been determined only by the nature and the attitude of the constituent rocks.

The drainage system in the district is comparatively simple. The Sha-ho or Chien-shan-ho in the northern part, and the An-shan-ho in the southern part, are the drainers of the district. Both rivers, after running westward for about 30 kilometres, make a typical meander and join the Hun-ho, which runs along south of Mukden and discharges into the great river, Liao-ho. Steep-sided valleys with many cliffs characterize these rivers. The formation of cliffs is probably due to several causes, such as concentrated rainfall, scarcity of vegetation and a surface deposit of very fine loess. It is recorded that at Dairen 64 rainy days occurred in the year 1919, and 73 days at Mukden in the same year.

DETAILS OF EACH MINE

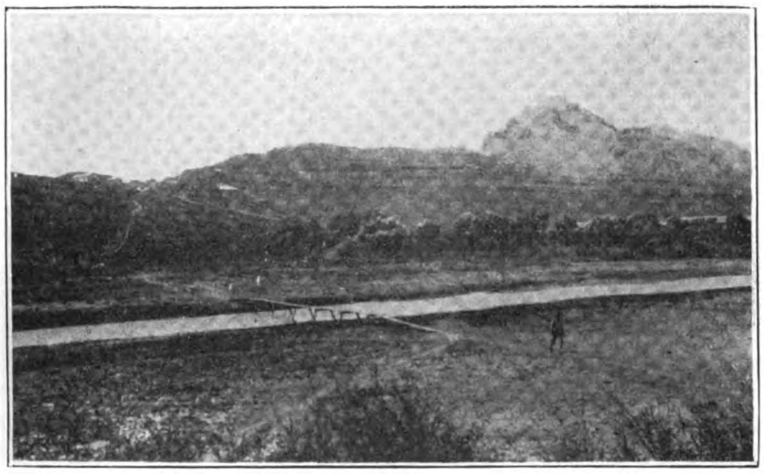
(1) Hsi-an-shan (West An-shan) Mine (Plates 4 and 5)

Hsi-an-shan mine is located between the station of Chien-shan and Tang-kang-tzu, being ouly one mile south of the former station.

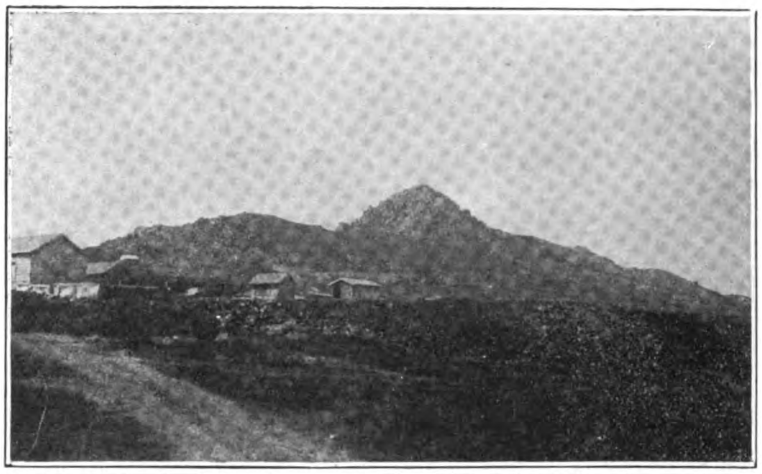


3. Scene of erosion plateau of the granite, looking north-ward 3 kilometres

3. View of Ping-shan, rejuvenated peneplain, looking northward 3 kilometres



4. View of the Hsi-an-shan mine, taken at a distance 1 kilometre northward. The river is the An-shan-ho



5. Peak, situated in the most eastern part of the Hsi-an-shan mine, taken from the northern slope

This is the most convenient location for the inspection of the An-shan iron deposits.

Although the highest peak is only 260 metres above the ground, Hsi-an-shan stands conspicuously with its characteristic features of rugged outlines, brought into higher relief amidst the surrounding lowland. The range is formed of three groups, the western, middle and eastern with the respective heights of 260,230 and 107 metres. They extend from east to west; the eastern end is cut by the river An-shan, along which the South Manchuria Railway and the main road run.

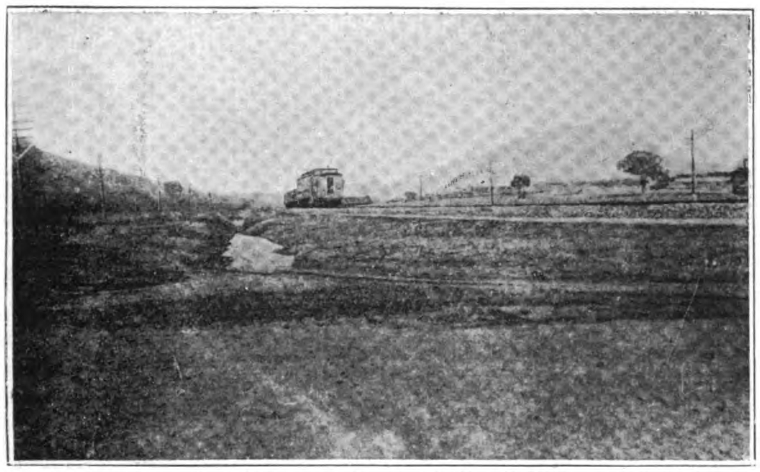
The prevailing rocks of the district are the green schist complex, hematite-quartz-schist, quartzite group and granite. The green schist complex consists mostly of slate, phyllite, sericite-schist, and talc-schist. The phyllite resembles in appearance a fine crinkled silk crêpe with undulating curvatures developed by severe dynamic pressure. Staurolite was probably once present, judging from a hollow looking just like a crow's foot. Sericite-shist and talc-schist are distributed locally near the zone of contact with the igneous rocks.

The hematite-quartz-schist controls the surface feature of the land, making an extremely rugged knob, due to its strong resistance against weathering. Its thickness measures generally above 40 metres. The quartzite group is made up of quartzite proper and siliceous slate, distributed widely on the northern side of the range and follows the slope of the surface. The quartzite frequently shows ripple marks and reveals the fact that it was formed in shallow water. Under the microscope, the rock shows general uniformity in size of quartz grain, and a nearly entire absence of any mineral other than quartz, except minute flecks of chlorite and magnetite. This purity is the result of sorting, which has caused the particles of other minerals to be removed, leaving only quartz grains. Secondary enlargements of the quartz grains are noticeable, under the microscope. Conglomerate measuring 0.15—0.3 metres in thickness overlies the hematite-quartz-schist; its fragments are angular hematite-quartz-schist and round grains of milky quartz, cemented by sandy hematite. On the lower northern slope, there are found the most recent deposits consisting of loess of a maximum thickness of 12 metres.

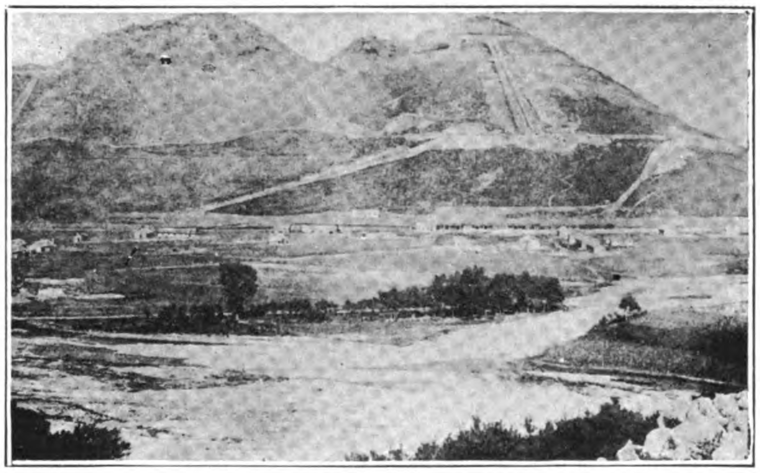
Granite is locally exposed on the southeastern slope of the range in contact with green schist. The prevailing minerals of the granite are pinc orthoclase, quartz and a small amount of muscobite. The granite shows more or less foliation, dipping to the north, and in it some quartz veins are exposed on the same slope. Some green schist in contact with the granite is metamorphosed to sericite-schist with much abundance of spotted quartz of 2-3mm. in size and the other is changed to conglomerate-schist which gives a minute aggregate of quartz and chloritoid with embedded quartz porphyritically.

Turning to the tectonics of the district, the great thickness of the green schist shows several undulations of the stratum with a gentle dip of from 10° to 30° and is conformably overlaid by the hematite-quartz-schist. The dip of the hematite-quartz-schist varies from 30° to 60°, underlying a thick seam of the quartzite, which gives generally a gentle dip of below 30°, and we can detect clearly the presence of unconformity between these two strata, judging from the occurrence of conglomerate, in addition to much difference in the dip angles. The contact metamorphic effect of the granitic intrusion into the green-schist is evidence of the early Cambrian age of the intrusive. The prevailing joint cracks in the hematite-quartz-schist are N 20°-30° E, dipping 60° southeast.

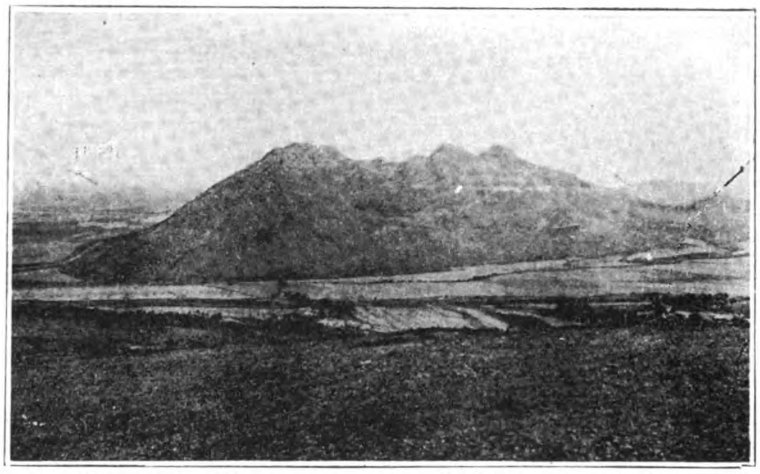
More or less high grade ore of primary origin has been worked in the eastern part of this mine, but the richer ore of the secondary origin is now much sought after. Some secondary ore has been found in the contact zone of the foot wall or hanging wall of the



6. Southern view of Tung-an-shan (right-hand side) and Hsi-an-shan (left-hand side), being crossed by the main line of the South Manchuria Railway Co. as seen from a distance 4 kilometres southward



7. Southern view of the Ta-ku-shan mine, as seen from a detached hill, 1.5 kilometres west



8. View of the Ying-tao-yuan mine, looking westward from a granite hill

9. Open work of the Ying-tao-yuan mine; only the enriched parts being mined, looking southward from No. 1 pit

hematite-quartz-schist, that is, on the green-schist or under the quartzite, forming the platy veins with an average width of 2 metres, but frequently pinching and swelling. Recently, it is reported that at the western end of the district, they have found rich ores formed in gashes of the hematite-quartz-schist, due to the great flexture.

2. Tung-an-shan (East An-shan) Mine (Plate 6)

Tung-an-shan mine is located adjacent to and east of the Hsi-an-shan mine and is cut at almost right angles by the river An-shan. The highest point of the Tung-an-shan is about 330 metres above the sea level, and it presents a commanding appearance in comparison with the surrounding level plains. From the top, one ridge runs northwest, and another eastward, and the southern slope of the mountain is generally steeper than the northern, this being due to the difference of the constituting rocks.

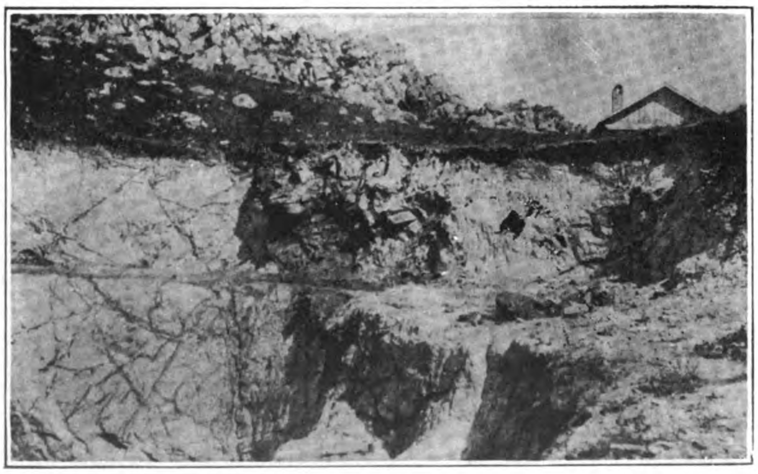
The main rocks are green-schist, hematite-quartz-schist, conglomerate, siliceous slate, quartzite in sedimentaries and granite in igneous rock. The green-schist complex are made up of sericite-schist and phyllite exposed in the higher parts of the southern and southwestern slopes of the mountain. The hematite-quartz-schist stands out on the prominent ridge; its position being due to its great resistance to weathering, and it is not difficult to distinguish its boundaries from other rocks, but at the east end, the quartzite overlies the hematite-quartz-schist making it difficult to tell the boundary.

The hematite-quartz-schist of the Tung-an-shan mine possesses greater fissility than that of the Hsi-an-shan. The conglomerate is well exposed and has commonly a width of 0.3 metres, but on the eastern cliff of the highest point, it swells locally to 2 metres and is frequently worked, because it contains iron to an extent worth tapping. The pebbles in the conglomerate are the round grains of secondary quartz and fragments of the hematite-quartz-schist cemented with the iron oxide in the form of alluvial sand. It is noteworthy to find talus deposits of the hematite-quartz-schist in the northeastern slope of the highest point, and some of them are mined as ore.

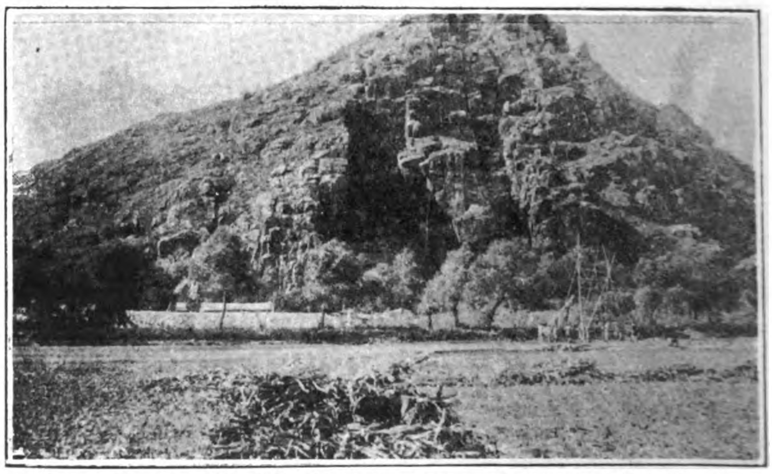
As a Cambrian base rock, the siliceous slate lies unconformably upon the hematite-quartz-schist and is underlaid conformably by the thick seam of the quartzite. It is exposed along the river bank and has commonly a reddish purple color, this being due to its containing iron oxide. In this siliceous slate, hematite-ore occurs to a width of 0.3-1.0 metre in the bedded form, but it is much restricted in quantity owing to its irregular distribution with the intervention of discontinuity at several points, which deprives it of commercial value.

The quartzite widely predominates to a great thickness on the northern and northeastern slopes of the mountains, protecting the several older and underlying seams above described. Ripple marks are frequently found in the quartzite. Granite occurs at the base of the hematite-quartz-schist on the southern slope in contact with it, sometimes directly and sometimes indirectly, in the latter case intercalating a thin seam of the green-schist. The rock is of a coarse structure constituting mainly pink orthoclase and quartz with slight flecks of muscovite; the weathering of the rock is so advanced as to make it impossible to get a fresh specimen.

As regards the tectonics, the hematite-quartz-schist strikes N45°-60°W and dips steeply above 50° to the northeast; especially on the cliffs along the river it forms above 75° and is nearly vertical in places. It need not be mentioned that the green schist occurs parallel to the hematite-quartz-schist. The strike of the quartzite is nearly parallel to that of the hematite-quartz-schist, (from north-



10. Showing the enclosure of a part of the hematite-quartz-schist in the gneissose granite (Ying-tao-yuan mine)



11. View of a cliff of the hematite-quartz-schist, formed by a transverse valley, measuring 140 metres in width. (Wang-chia-pu-tzu mine)

west to southeast), but it dips at a very gentle slope below 40°, and it is certain that the contact marks an unconformity ; this is further substantiated by the occurrence of the conglomerate.

The intrusion of the granite dates later than these sedimentary rocks, judging from the intrusion into the green-schist, and in the neighborhood of the present river some masses of the hematite-quartz-schist seem to have been pushed forward by severe eruptions of the granite magma. The granite has a schistosity NW-SE, following the common direction in the An-shan district, due to the deformation suffered.

The occurrences of secondarily enriched ores in the Tung-an-shan mine intercalating amidst the hematite-quartz-schist to a width of 1.5 metres and usually accompanied by some porous limonite. Frequently, along a local fault plane, the hematite-quartz-schist is broken into fine pieces, and the schistosity disappears owing to the great friction, forming an enriched limonite of extremely loose structure.

3. Ta-ku-shan (Plate 7)

Ta-ku-shan mine is located 12 kilometres southeast from the An-shan station and is connected with it by a branch railway for the transportation of the ore. The base of the hill is 43 metres above the An-shan station. "Ta-ku-shan" literally means a prominent solitary mountain. It may be seen from a distance, rising about 180 metres above the surrounding alluvial lowland. The long axis of the mountain extends northwest-southeast, and the northeastern side is less steep than the southwestern, due to the differences in the rocks. It is dissected into two parts along a fault. The eastern part rises 290 metres above the track level, and the western part is a little lower.

The rocks are green schist, hematite-quartz-schist, quartzite, granite and diabase. Green schist in considerable thickness occurs overlying the hematite-quartz-schist. In the green schist formation, staurolite-phyllite and chlorite-schist are the most common rocks. Green schist exposed at the foot wall of the hematite-quartz-schist is generally very thin, intercalating frequently in the iron formation.

The hematite-quartz-schist constitutes the essential part of the mountain and forms an extremely rugged knob which is common in the district. Its fissility and its distinct magnetism are the noteworthy characteristics of this mine. It is also noticeable in this mine that the hematite-quartz-schist contains much actinolite besides a small amount of siderite, calcite. The hematite-quartz-schist has been worked as a primary ore to the total amount of about 80,000 tons since 1918. The average grade of the hematite-quartz-schist in this mine is about 35 per cent. to 36 per cent. of iron.

The quartzite occurs overlying the green schist, and frequently contains much iron oxide, but not enough to make it of commercial value. It is called ferruginous quartzite to distinguish it from the hematite-quartz-schist. In the Kuan-mien-shan mine, about 8 kilometres east of the Ta-ku-shan mine, ferruginous quartzite occurs above the hematite-quartz-schist, with a thick seam of green schist between them, just as is the case with the Ta-ku-shan mine.

The intrusive rock developes on the southwestern slope of the mountain, intruding the green schist (Fig. 5) and it is not difficult to detect the boundary with the other rocks by the surface feature, because of its ready erosion, although the exposure is generally very bad. The rock shows a distinct schistosity. It is composed of pink felspar and fine flecks of muscovite accompanied frequently by green dyke rocks and quartz veins. Judging from occurrences and its mineralogical characters, the rock seems to be a variety of the gneissose granite.

In the hematite-quartz-schist, the strike is E-W on the west side, and varies until it becomes N 70° W on the east side. The dip varies from 45° to 70°, always towards the north. On the southern slope of the mine, we found severe contortions of the strata suggesting a great synclinal structure of the hematite-quartz-schist.

The green schist strikes just the same as the above stratum, dipping over 70° towards the north. The direction of the schistosity of the granite is nearly parallel to the hematite-quartz-schist ; this means that the mountain making stress was later than the eruption of the granite. Besides the great fault in the central part, several minor parallel faults are seen in the hematite-quartz-schist, crossing the strata at nearly right angles, through which some minor intrusions of diabasic dyke rocks occur.

The formations of the secondarily enriched ores are accompanied by limonite and milky quartz of open texture. In the western part, the ores are found upon the impervious bed of the green schist, while in the eastern part, they occur in a cavity formed by a local flexure. The ore-bodies vary in size, sometimes assuming a tabular form with a width from 1 to 2 metres. They assume in rare cases the form of an irregular round mass swelling to 5 metres in width, and from one body there could be mined as much as 500 tons, it being often possible to produce above 1,000 tons. The hematite-quartz-schist of the Ta-ku-shan mine often has a sufficiently high content of iron, that it can be worked for commercial purposes.

4. Ying-tao-yuan Mine (Plates 8 and 9)

The Ying-tao-yuan mine is located 12 kilometres due east of the An-shan station, but the railway line for the transportation of the ore runs around the north side and is more than 15 kilometres in length. This mine is situated in the northern division of the An-shan iron district, and the highest peak rises to an altitude of 150 metres above the surrounding alluvial plain. The range of the mine runs from NNW to SSE parallel to the strike of the hematite-quartz-schist, which constitutes the main part of the range.

The hill, in which the Ying-tao-yuan mine is situated, is formed of green schist, hematite-quartz-schist, quartzite and granite with minor diabase intrusions. The hematite-quartz-schist contains mostly a low percentage of iron, having never been worked. Only the secondary ores are mined. In the northern division of the Ying-tao-yuan mine, there occur secondarily enriched bodies, formed at the contact with the granite mass, accompanied by schists containing: scaly flecks of phlogopite, "devil's pyrite" and fine crystals of magnetite, etc. Some chlorite-schist seems to be formed from the hematite-quartz-schist, at the contact with the granite. Metamorphism due to the contact action is restricted to a comparatively small area, and the hematite-quartz-schist, a short distance from the contact, remains as poor ore.

The green schist has several phases ; it is constituted of phyllite, chlorite-schist, sericite-schist and diabasic rock. The quartzite is predominant in the northern part of the district, and also locally remains overlying unconformably the hematite-quartz-schist. It frequently contains sericite. The intrusive rock is distributed abundantly in the north and northeastern part of the district. It is constituted mainly of pink felspar (orthoclase ?), microcline and quartz with a very small amount of black minerals. The rock is a acidic granite, judging from the chemical analysis (page 19). In the peripheral part of the granite, there appear muscovite and talcose felspar of indistinctly granular structure. Beside the granite, some traces of other diabasic intrusive rock could be detected in the northern part of this mine.

Reviewing the tectonic of the Ying-tao-yuan mine, the original arrangements of the hematite-quartz-schist and the green schist have been broken into pieces by the severe dynamic action due to the intrusion of granite magma (Plate 10). In the northern half of the hematite-quartz-schist, the strike varies from northwest on the north side, then turning northward, to northeast on the south side, and the dip varies from 55° to 75° always toward the west. It is nearly vertical on the cliff at the southern end.

It is noticeable that no green schist occurs in the foot wall of the hematite-quartz-schist, probably having been swept away from the place by the intrusion of the granite. In short, the great intrusions of the granite into the hematite-quartz-schist will tend to enhance the high grade of the secondarily enriched ores.

5. Wang-chia-pu-tzu Mine (Plate 11)

The Wang-chia-pu-tzu mine adjoins on the south of the Ying-tao-yuan mine, forming the boundary line with the valley Chi-chia-kou. The axis of the deposit runs from northwest to south-east. The hill is as usual composed mainly of the hematite-quartz-schist. The mine-lot is separated into three divisions, No. 1. No. 2 and No. 3 being divided by small valleys from the southern end, while No. 3 rises most prominently, being 230 metres above the An-shan station.

The rock of the mine is formed of sedimentaries such as green schist complex and hematite-quartz-schist with granite as an only intrusive.

The green schist complex is composed of diabase-tuff, hematite-schist and chlorite-schist at the foot wall of the hematite-quartz-schist, and sericite-schist and sericite-quartzite at the hanging wall, as seen on the geological map. The hematite-quartz-schist is the prevailing rock in the district, measuring 140-170 metres in breadth, but due to a low iron content, it has not been used as ore.

The ore mined is all of a secondary origin, being formed at the contact between the hematite-quartz-schist and the granite, intercalating commonly thin layers of green schist. On closer observation, there are found the alternation of Lematite-quartz-schist and several kinds of ores, of which we can distinguish three kinds; compact ore, banded ore and ore associated with the green schist, while there are gradual transitions between the compact and the banded ore with accompanying pyrite and milky quartz. The ore associated with the green schist is formed by the admixture of iron oxide and green schist, to such an extent that the percentage of iron reached a commercial value, but the last is a rather rare case with the ores of the An-shan iron district. The breadth of the ores varies 0.3-4.0 metres, always occuring parrallel to the strike of the hematite-quartz-schist. (Plate 12-13).

A variation of the breadth of the ores is seen at a rather short distance, the ore being frequently found in irregular round masses. Judging from the occurrences and the allied minerals above described, the formation of the secondary enrichment seems to belong either to a contact metamorphism between the granite and the iron formation or to the action of the descending meteoric water. In this mine, we often find some rich porous ore of weak structure, due to the process of the leaching of silica, leaving the ore as residue.

Mining in Shantung

IN Shantung metallic and non-metallic minerals of many kinds are to be found in great abundance.

In the eastern part of the province, which is near the sea, most of the minerals are metallic; while in the west, bordering on the provinces of Chihli, Honan and Kiangsu, the minerals are mostly non-metallic. Among these coal figures foremost.

The general conditions of mining of the province are as follow:

Gold is very important among the metallic minerals. The gold mine in the Lo Hill of Chaoyuan district is the most notable, and its vein covers several *li*. Twenty years ago it was abnormally productive, but recently it has gradually declined.

There is also a famous gold mine at Ju Tien, in the district of Pingdoo, that has been worked for 300 years. The total value of the minerals taken out at intervals amounts to at least $10,000. There is a gold mine at Weihaiwei, in the district of Wenteng. It is a British enterprise, and belongs to the Wei Hai Mining Company, but it is said to be unprofitable. There are also large amounts of gold dust in Fushan, Ninghai and Mao-ping. Also there are mines exploited by old methods in Lingchu, Anchiu, Poshan, Ishui and Chu-Hsien.

According to the reports of the geological survey of China of the ministry of agriculture and commerce, the amount of gold in Shantung is 2,600 ozs., and occupies a mineral area of 332 *mow*, and the whole area of developed mines of all kinds is 477 square *li*.

Copper, Iron, Lead and Tin

The province has silver, copper, iron, lead and tin. The largest copper mine is that of Tao Shia-chwang, in Licheng. It is developed by Mr. Chu, conjointly with a Japanese company. The largest iron mine is that at Ching Ling Chen, in Itu. There is magnetite, limonite and hæmatite in this mine, and the Germans formerly had ambitious plans with respect to it. It now belongs to the Shantung Railway, and is owned entirely by Japanese. It is reported that the quantity of iron in this mine is 14,000,000 tons. The magnetite at Ching Hua Sahn, in Peng Lai Shan, and the hæmatite mine at Au San Kao, in Che Hsien, are also well known.

As to lead, Pingdoo and I Hsien have the largest quantities. There are tin mines in Lingchu, Chu Hsien and Che Hsien. There are also small quantities of quicksilver and arsenic.

As to the non-metallic mines of this province, the principal ones are coal, quartz, clay and quartz crystal. The largest coal mines are in Wei Hsien, Fangtse, Tsechuan, Hung San and Che Hsien. Among these the Hangsan mine is the richest. The Chung Hsin Company in Che Hsien is managed entirely by merchants. Its yearly product is above 300,000 tons and its future is promising as it has an extensive market throughout the lower Yangtze region. Although the Hua Feng Company of Ningyang came into existence later, its yearly output already reaches the total of 600,000 tons. It formerly belonged to Germany, and is now occupied by Japan.

There are great resources along the Kiaochow-Tsinan line. In addition there are coal mines in Fei Hsien, Lin I, Yencheng, Changchue, Ningyang, Hsintai and Laiwu, but in these districts the mines are largely developed by ancient methods, there being no large-scale production.

New Industry in the F.M.S.

China Clay Works in Perak

THERE has been established recently in the Federated Malay States a new industry which is likely to have a far-reaching influence upon the economic life of those states and may have the effect of inducing capitalists to launch other local enterprises of an industrial nature.

The new concern is the Malayan China Clay and Pottery Company, Limited, which has been formed to work the rich clay deposits found in the alluvial tin-mining districts of the State of Perak. The Sultan of Perak is taking a keen interest in the developments.

The initial work was begun 12 months ago, and the Malay workers have proved such apt pupils that the company is already turning out porcelain of a high standard of quality. Both the casting and the "jolleying" methods are employed, and it is said that by the latter method a native operator with a little experience could turn out 2,000 latex cups (used for collecting rubber) in a working day of eight hours. With an installation of 12 machines, it is expected that the works will manufacture latex cups at the rate of over 30,000 per day, and it should be possible to place these latex cups on the market at a price against which the imported article could not compete.

Before manufacturing, the company gave a valuable prize for the best design for a latex cup, and this prize was won by a local planter.

The works are established at Gopeng, in the centre of the tin-mining district. Apart from the manufacture of articles locally, the company is supplying china clay to two of the largest groups of cotton mills in Bombay and to paper mills in Calcutta. It is understood that people connected with the English china clay industry have offered to buy the whole of the Gopeng output, and that the clay has been proved definitely to be equal in quality to the best English china clay. When the labor is more skilled, the company intends to make porcelain in bulk.

Dutch East Indies Development

THE big public works program for 1922 which has been undertaken by the Netherlands East Indies government, will give some idea of how the Dutch are using the recent loan floated in the United States and England. The largest item in the budget, as will be seen from the following, is for harbors, mines and transportation.

PUBLIC WORKS EXPENDITURES

	Dutch Florins.
Building and workshops required for the postal telegraphic and telephone service	1,406,500
Buildings and works necessary for the maintenance of the salt monopoly	135,800
Buildings and works necessary for the government printing department	441,350
Buildings and other works required by the marine department	1,317,750
Buildings and workshops necessary for the aeronautics (advancement)	1,410,000
Bridges and constructional works for the maintenance of canals, rivers, dykes	9,343,000
Irrigation, drainage, dams, and pier works	14,424,000
Work in the interest of public health	4,015,500
Harbor of Tandjoeng Priok (Batavia)	9,697,125
Harbor of Soerabaja (Java)	15,466,503
Harbor of Makasser (Celebes)	816,492
Harbor of Belawan (East Coast of Sumatra)	5,747,430
Harbor of Emmahaven (West Coast of Sumatra)	904,261
Harbor of Semarang (Java)	2,306,805
Harbor of Tjilatjap (Java)	861,730
Small harbors	3,302,324
Other expenses indirectly connected with the harbor service	1,437,000
Dredging service	5,075,075
Expenditure in connection with the development of hydraulic and electric power	7,670,825
Exploiting of government mines	39,266,044
Preliminary steps connected with the possibility of exploiting iron ores in Celebes	Not yet decided
Post, telegraph, and telephone service	22,989,060
State railways and tramways, also automobile services	93,010,020

Even so large a program, however, can only be appreciated by those who have some knowledge of the extent and potentialities of this group of markets. Java alone has a native population of 36 millions, who are every day, as the development of their country advances, becoming better buyers of manufactured goods in great variety, particularly textiles, hardware and footwear; while the planters and industrialists are growing users of agricultural and other machinery, motor vehicles and chemicals.

Of the 3,323,000 acres under rubber cultivation in the world as many as 885,000 acres, or nearly one-fourth, are in the Dutch East Indies; palm oil is produced there to nearly 100,000 tons annually, against 125,000 in West Africa, and is of purer quality as a result of better processes; 90 p.c. of the world's supply of quinine comes from Java. Java tea takes precedence in quality over all other varieties; the same island can produce four tons of sugar per acre against only one ton in India. More than half the total of Singapore tin is drawn from the Dutch East Indies; amazingly rich deposits of nearly pure copper have been recently discovered in Timor, iron and coal quite near the surface in Celebes, and diamonds in Borneo; gold is being mined in Sumatra; and enormous forests of teak exist in the last island, and are only awaiting exploitation.

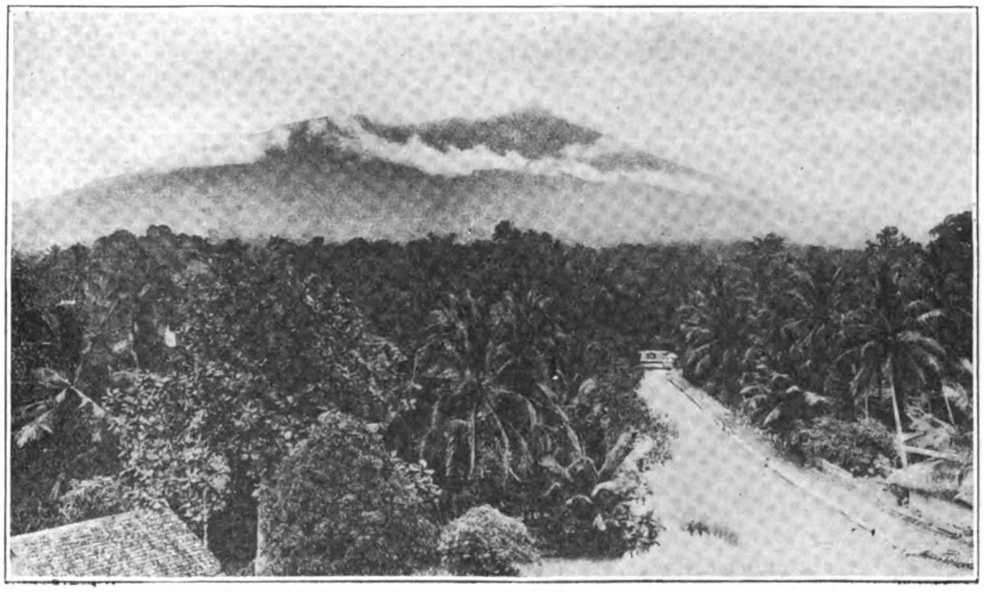
Borneo, as yet practically undeveloped, is, excluding the continent of Australia, the largest island in the world, and Sumatra, practically undeveloped also, is destined to prove one of the richest. Java is at present the only island of this group where the vast agricultural and mineral wealth is being exploited to any degree, and when Sumatra, in the future, is developed to an equal extent, her importance as a world supplier will be colossal.

Rubber—now rising once more in value—tea, sugar, coffee, quinine, copra, palm-oil, tobacco, pepper, and nutmeg, to mention only a few of the many agricultural products, are nearly all found in such quantity that the presence of a single commodity would ensure the importance of the islands. And in addition to these there are the wealthy tin mines of Banka and Billiton, the recently-discovered copper mines in Timor, and petroleum wells, gold, diamond, coal, and iron mines scattered broadcast.

It is to these islands that India must look for a great deal of the raw material she will require as her needs increase and as the output of her industries grows greater. The Djambi oil-fields, from which are obtained annually over 17,000,000 barrels of petroleum, are the nearest source of supply for her motor industry, and, to-day, Dutch East Indian spirit is to be found in the tanks of motor-cars throughout the empire.

Java practically controls the world's quinine supply, and enormous quantities of this drug pass from the Dutch East Indies to Calcutta and other ports.

A considerable bulk of what is known as "Singapore tin" comes in reality from the mines of Banka and Billiton, and Java ranks chief among the exporters of sugar to India. During September, 1,081,478 cwts. of the best grade alone—"Java 23"—found their way into Indian warehouses.



The Beautiful Roads of Java: View of Mt. Salak near Buitenzorg

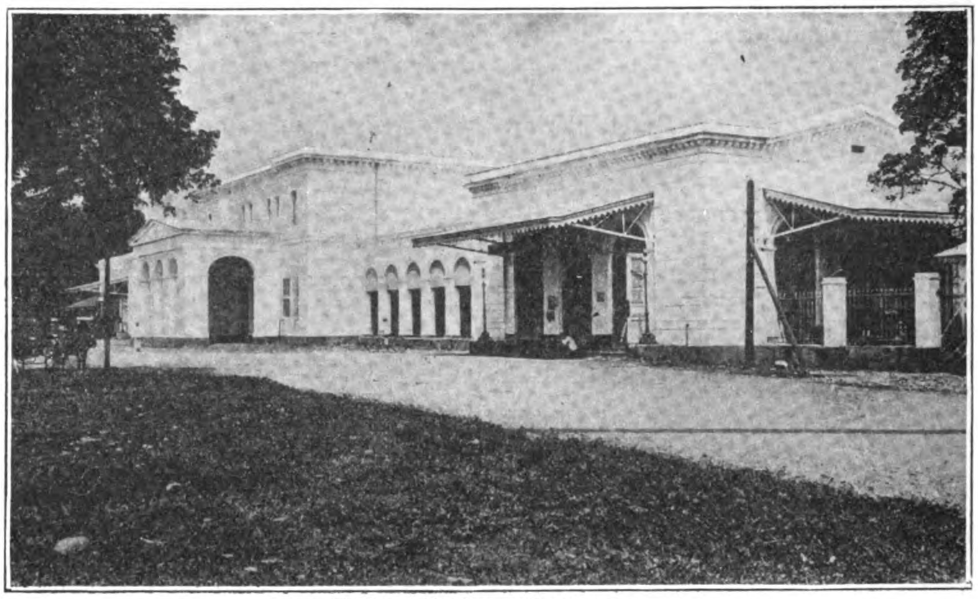
One of the newer plantation industries—so far as the Netherlands East Indies are concerned—is the cultivation of the oil-palm, and it is not beyond possibility that this branch of agriculture will prove the source of great additional wealth.

It is only a comparatively short time since the first oil-palms were brought into the islands, but in Sumatra, especially, the industry is developing at such a

tremendous rate that the position West Africa now holds in this respect is being seriously menaced.

According to a conservative estimate in a very few years 100,000 acres will be covered with oil-palms in Sumatra alone, and the exports from that island will be something like 100,000 tons annually.

Copra production is, of course, an older industry, and, at present, a more important one. Throughout the world there is a serious shortage of edible fats for both human and animal consumption, and exports of this produce will have to increase to an enormous extent before any difficulty will be experienced in finding a market. India, alone, is a copra buyer of enormous potentiality, and her proximity to the Dutch East Indies will undoubtedly react favorably on the market. If Sumatra had been developed a little earlier, perhaps vegetable and not animal fat would have been used to smear the cartridges used by the Indian soldiers in 1857, and it would have needed another pretext to plunge the country into war.



Railway Station at Buitenzorg

Copra, one of the main constituents of margarine and of the other fatty compounds used in the preparation of food, is the fruit of the wonderful *klapper*, or coco-nut palm, which can be used in such a multitude of ways. No part of the tree is thrown away. Fruit that falls to the ground before it is ripe is made by the natives into medicines. Ripe nuts are eaten both raw and cooked. The hard shell is made into spoons, mugs, and plates; and from the fibrous covering we obtain what is known as "coir," which is made into string, matting, brushes, etc. Even the leaves of the palm can be used to thatch the native huts; and when the tree is tapped, alcohol can be distilled from the latex. Copra is made from the kernel, and its importance has increased tremendously since the discovery of the "deodorizing" process. It is very largely used in the manufacture of cattle-foods, such as oil-cake, as well as in the manufacture of margarine, etc.

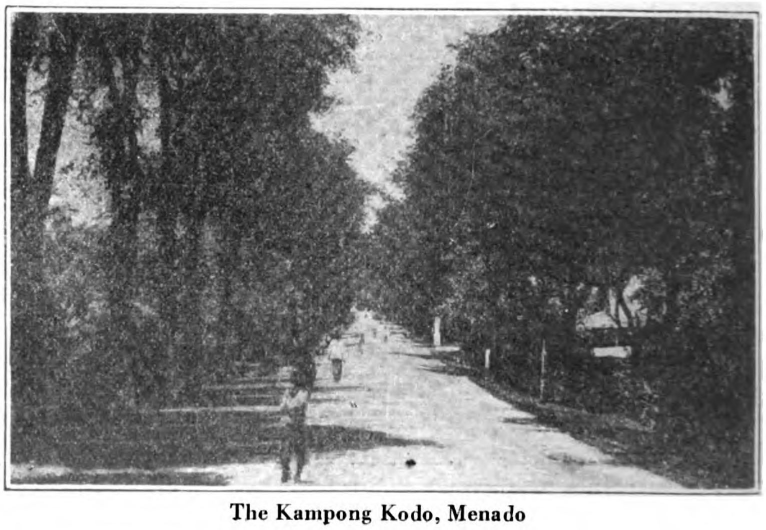
Agriculture is the principal but, nevertheless, only one occupation in the Netherlands East Indies. Factories are hard at work turning out all kinds of goods, and ships are being built in at least two of the seven well-equipped shipyards to be found in the islands. Ropes, bricks, chocolate, jam, are all manufactured to some extent; but the whole of this production is swallowed up by the home demand, and still the islands offer—indeed invite—tremendous opportunities for trade.

A great opportunity exists in providing machinery and other plant required for full industrial exploitation. For example, there are now 14 large factories in Java alone producing copra, and a further seven in the other islands. Old factories are being enlarged and re-equipped, and new ones built. In 1920, 400,000,000 kilogs. of crude oil were produced. So excellent is the organization of the sugar industry that the sugar committee of India have recently expressed the opinion that the adoption of Javanese methods is essential to progress in the Indian sugar industry. There is undoubtedly an excellent opening at the present time for makers of machinery for sugar mills to do a large trade with the Dutch East Indies, and the same is true of rice-milling plant, in Java alone there being upwards of 50 rice mills. As a sugar producer Java ranges next after Cuba and British India, the island's production coming little short of two million tons annually. In addition to the plantation products already mentioned Java produces in abundance coffee, cocoa, tobacco, coconuts, fibres of various kinds, and many spices.

Comprehensive Irrigation Schemes

Increasing attention is being directed to irrigation, and it is to the credit of the Dutch Government that it has always promoted enterprise in this direction. But the primitive irrigation of the past is now being superseded by more comprehensive schemes, which are being actively pushed forward not only in Java and Madura, but wherever possible in Sumatra, Celebes, and in the southern and eastern districts of Borneo. In the five years from 1914 to 1918 over 33 million guilders were spent on irrigation works in Java and Madura, and 3,500,000 in the outlying islands. But this is regarded as only a beginning, and in all the islands the authorities are showing increasing activity in this matter, with the prospect that in the near future the agricultural possibilities of the Dutch East Indies will be enormously enhanced. In the meantime, the

The Oranje Hotel at Soerabaia



The Kampong Kodo, Menado

work is involving considerable engineering activity and the placing of important contracts.

The Growing Demand for Factory Equipment

Manufacturing industries in this market are still in their infancy, but, the tendency in this direction is significant, and the opening for industrial plant are steadily increasing. Already the manufacture of bricks and tiles, soap, card-board, tinware, paint, brooms, sugar, molasses, beer, leather, rope, casava flour, macaroni, and various chemicals has been undertaken, and even a glass factory is under consideration. Machinery, tools, and implements were before the war supplied almost wholly by Germany, who held the market by keeping local stocks of replacements and repairs. But the demand for these appliances is now much larger, and so far Germany has not been able to makė any considerable post-war impression on the market. In regard to carpenters' tools, the trade is chiefly in cheap hammers, a popular type having the steel handle extending through the eye and locking on the upper side of the head.

An Especially Big Market for Motor Vehicles

Communications in Java are good, but in the outlying islands they are still inadequate. Java is well supplied with railways and a good net-work of well-kept roads upon which run motor vehicles in increasingly important numbers. There are over 20,000 motor cars in Java alone, most of them of American make. From January to April of the present year 2,642 cars were imported, of which as many as 1,711 came from the U.S.A. The climate is especially destructive in regard to tyres, for which the demand is therefore proportionately large. The types of commercial lorries mostly in use on the estates are varied, the vehicles being mainly of two to three tons capacity, and equipped with tipping devices.

The Dutch East Indies are a particularly big market for cotton goods, importing no less than 42,631,000 kilogs of cotton cloths in 1920, in addition to 167,000 kilogs of woolens, 67,000 of half-woolens, 140,000 of silk, and 20,000 of half-silk goods. This was practically double the amount for 1919. British cotton goods are preferred, and in 1920 Great Britain supplied 14,098,000 kilogs, against 10,282 by Holland. Japan two years ago was the biggest source for imports of alum, copper sulphate, and sulphuric acid, and one of the biggest in calcium carbide and sodium carbonate. The contributions of Japan in all these lines is this year *nil,* while Germany's is steadily increasing.

The Need for Local Selling Agencies

Sufficient will have been gathered from the foregoing to indicate that the Dutch East Indies are worth a great deal more commercial attention than is at present paid to them. As a purchaser of all descriptions of merchandise they are already taking a high place, but their prospective value is infinitely greater. The present business is transacted chiefly through a few big firms established at the principal ports of Java, and is exceptionally safe in character; but, whether for good or evil, there is no denying the fact that tendencies are becoming apparent which have for their object a widening of commercial activities and a breaking away to some extent from the influence of the old-established importing concerns, who are sometimes accused of obstructing the introduction of new lines. The only practical way to attempt to gain an entry to the market is by establishing local agencies. That might not be possible in all cases, but groups of manufacturers might combine successfully. The big estates especially are excellent buyers, and are keen for anything which is suitable for their requirements and up-to-date.

Huge Trade Openings in Prospect

To open an office in the Netherlands East Indies it is necessary to register with the authorities in Batavia, but otherwise there are no restrictions under Dutch law. It is, however, essential that representatives of business houses should establish their credit with Dutch organizations, and they should have the highest credentials, carrying as many influential introductions as possible, while a full knowledge of the standing of their principals should be lodged with the leading banks. Here, then, is a market with an industrious population of upwards of 40 millions, with a particularly astute and progressive body of planters and industrialists, a government keen to promote development in every possible way—for the Dutch are specially successful in colonial administration and enormous natural resources that are steadily being opened up. No greater inducements could be offered for the application of persistent commercial enterprise.

Powerful Reclamation Dredger for Bombay

MESSRS. Wm. Simons & Co., Ltd., Renfrew, has launched a large cutter suction pump reclamation dredger which they have constructed for the high commissioner for India for work at Bombay in connection with the Back Bay reclamation scheme which is being carried out under the direction of Sir George Buchanan, K.C.I.E., etc., of Messrs. C. S. Meik & Buchanan.

The dredger which is named the *Sir George Lloyd* after the governor, is fitted with a powerful pumping plant designed to dredge 2,000 yards of clay per hour from depths up to 70-ft. and discharge same through a floating pipe line fitted with ball and socket joints to a distance of 5,000-ft. from dredger. On certain sections of the work for which this dredger has been designed, the distance of discharge required is 10,000-ft. and to permit of this distance being obtained, the builders have on hand a floating pumping station arranged for coupling to the floating pipe line, and fitted with plant capable of discharging to a distance of 5,000-ft. and to a height of 16-ft. above water level.

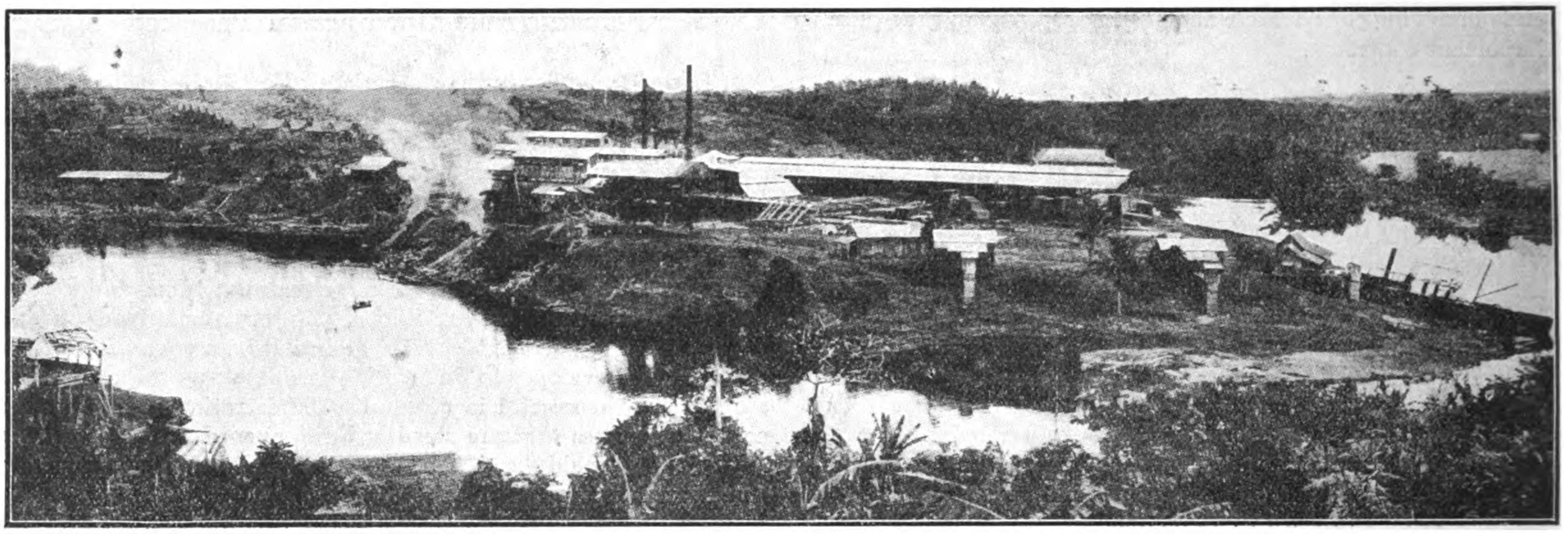
The dredger has been constructed under the supervision of Messrs. Sir J. H. Biles & Co., Glasgow and London, naval architects to the Indian government.

It is arranged that the vessel will proceed to Bombay under her own steam and for this purpose two sets of compound surface condensing engines are provided, capable of giving the dredger a speed of 8 knots.

The pumping outfit consists of a very large centrifugal suction and discharging pump directly coupled to a set of triple-expansion surface-condensing engines. A spiral rotary cutter is fitted on lower end of the suction frame driven by steel spur gearing by a set of compound-surface condensing engines. The suction frame is controlled by independent steam hoisting gear.

Steam is supplied by four large cylindrical multitubular boilers constructed to Lloyd's requirements for 180-lb. working pressure and fitted with Wallsend-Howden forced draught and oil fuel installation.

The control of the dredger is centred on the operating bridge, so that one man can direct all the operations of the dredger and the pipe line, also the intermediate pumping station, telephone communication being fitted between the vessels.



Mill of Insular Lumber Company on Island of Negros

Export Timbers of the Philippines

THE Philippines possess a much greater supply of wood than will ever be used for local demands. The wood consumers of other countries can, therefore, find here a market that will furnish them a large and varied supply for practically all uses to which wood is put; large, because of the immense amount of certain widely useful species which can be obtained by the millions of board feet; varied, because the woods of few countries of equal size, if indeed any at all, can show a wider range of color, grain, hardness, strength and other qualities demanded by special uses. It is no exaggeration to say that some species of wood can be found in the Philippine forests to suit almost any imaginable purpose the user may have in mind.

Export timbers fall roughly into four principal classes; woods for interior finish and furniture, cabinet woods, woods for special uses and heavy construction timbers.

1. *Interior Finish and Furniture Woods.*—The prime requisite of a wood for these purposes is that it be at least fairly abundant. Also, it must be not very difficult to work and to finish, of good size, and last, but not least, of pleasing texture and color. All of these requisites are fulfilled by the woods of the dipterocarp (lauan) family. This family (to which belongs nearly three-fourths of the standing timber of the Islands) occupies the place that the conifers do in the North Temperate Zone, but possesses a wider range of color, hardness and other qualities. The lauan group of the dipterocarps contains the greatest amount of timber specially fitted for interior finish and furniture. Tanguile, red lauan, almon and white lauan are obtainable in great quantities, have a fine ribbon grain when quarter-sawn, and, in texture and color, the first two resemble true mahogany and its substitutes very closely. White lauan differ from them only in color, being white with a very pale grayish-brown tint. It is pretty in natural finish where a light color is desired and, on the other hand, lends itself very well to staining. Almon, a very pale red lauan, is similar to white lauan as regards stains. All of these were little exploited and used during the Spanish *régime*, but the estabishment of the steam logging industry has put on the market an ever-increasing supply, so that now large quantities are used for medium and high-grade interior finish and furniture. These woods are now being used in Europe and America in the manufacture of high-grade furniture for cases of musical instruments, such as piano and phonograph cases, and for other uses where a beautiful figured wood is desired. The wood is also strong and for this reason it is used in the manufacture of aeroplane blades.

The other woods of the same family, guijo and apitong, are also abundant. This fact and their greater hardness enable them to fill a demand for flooring in place of oak, red beech, maple and other American woods which are yearly becoming scarcer. Guijo is light ashy brown to reddish brown and apitong is somewhat darker. Finished with wax or varnish, they range from reddish brown to dark chocolate. Both are hard and of rather fine texture. If a very hard wood is desired for flooring, yakal, the hardest and heaviest of the dipterocarps and the most abundant of the hard, heavy and durable woods in the Philippines, will fine a place.

There are several woods of other families which, though not as abundant as the lauans, are still to be obtained in sufficient quantities to supply industries that do not require many millions of feet per year. Such are lumbayau, pagatpat and nato. Lumbayau is similar to red lauan in appearance, but is slightly harder and tougher and has a more conspicuous flake grain when quarter-sawn; nato is of similar color and texture, but of very homogeneous grain; pagatpat also is very even-grained, but of a rich dark-brown color.

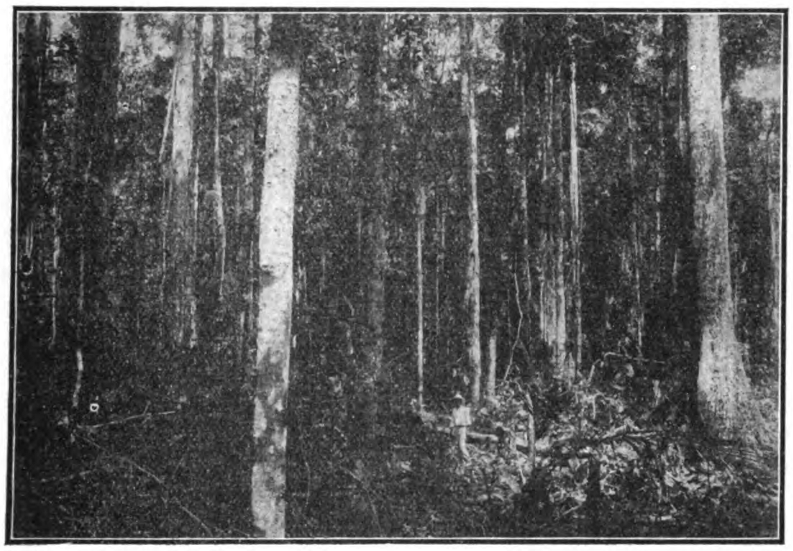
There are also frequently used in the Philippines narra, tindalo, acle, molave, supa, calamansanai, ipil and other hard, durable and beautifully colored woods; for the export trade, however, these woods, on account of their beauty, comparative scarcity and higher price, should be rather classified as cabinet woods.

2. *Cabinet Woods.*—Of these the Philippines possess such an astonishing variety that it is difficult to give any idea of them in a short pamphlet. Foremost among this class on account of their large size, beautiful color and grain and durability are the woods of the narra (or locust) family—acle, banuyo, ipil, narra, supa and tindalo—all of which would delight the eye of every American maker of fancy furtniture and cabinet-work. A dining-room set, a piano, a billiard table, or any similar piece of furniture made of one of these would attract attention at once no matter what comparison it might have to bear with other aristocrats of the lumber world. To attempt an enumeration of different classes of cabinet-work, naming for each one the various Philippine woods available would necessitate much unnecessary repetition. Perhaps the easiest way to give the cabinetworker a notion of what he may demand (and obtain) for his purposes is an enumeration of some of the better-known woods roughly classified by colors: Black-ebony; black, streaked or mettled with red-brown or gray-camagon, ata ata, bolongeta (the Philippine persimmons); dark brown-dungon, ipil, mancono, pagatpat, pahutan; reddish brown- apitong, batete, betis, katmon, guijo, nato; red amugis, bansalagin, ka-

lantas, nato, palo-maria, sibukao, tabigi, tukangkalau; grayish-banawi, makaasim, tabau; yellow-alintatau, bankal, batikulin, malakadios; pale straw color, creamy or nearly white—lanete, miao, white nato, molave. It must not be thought that the foregoing list is complied with a view to còlor alone, any and every wood, good, bad or indifferent, being dragged in to fill up; on the contrary, those named are all good woods, rarely attacked by boring insects, and not generally subject to discoloration except in the case of such light-colored woods as are easily stained by too slow or otherwise inefficient seasoning. In fact, the list could be doubled by including other woods used, on account of their varied color and grain, for musical instruments, fine cabinetwork, sculpture and carved articles, canes, hilts and sheaths for weapons, inlaid and mosaic work, desk and toilet novelties, picture frames; etc.

3. *Special Uses.*—For bowling balls, bearings, stern shaft bearings, mancono has been used successfully. For the firat-named purpose, dungon has also been found good. Bansalagin, alupag, malabayabas and tiga, all of fine texture, difficult to split, and very heavy, are recommended for experiment. For such articles as dumb-bells, paperweights, etc., requiring weight but not necessarily so fine and tough a texture, not only these, but a considerable number of other very hard and heavy woods are available.

For tool handles and other wooden parts of tools, there are generally required woods that are either hard or tough or both.



Typical View of Hardwood Forest

Philippine Forest Trees—Island of Negros

Chisel and hammer handles and mallets especially need to be hard, tough, and difficult to split; for these agoho, betis, calamansanai, dungon, guijo, malugai, palo-maria and yakal can be supplied; all these woods are by far more resistant to white ants and fungi than either hicory or ash. Handles made from the latter woods have to be continually moved in ware-houses of the tropics because white ants and other insects attack them very readily; two of these, guijo and yakal, can be obtained in very large quantities, while the others occur in quantities sufficient to make tool handles, if not by millions, at least by thousands. Most of these, as well as many others equally hard or harder but not so tough, would supply turned and shaped handles such as grips and butt plates for braces and drills, plane and saw handles, plane bodies, scratch gages, scraper and drawknife handles, and hollow-tool handles.

For long agricultural tool handles, in which hardness is less essential than toughness and difficulty of splitting guijo, the hardest grades of lumbayau, malugai, manggachapui and yakal would make excellent substitutes for ash. The same species, with the exception of lumbayau, would make good axe handles.

For wagon tongues and other vehicle stocks, hubs, spokes and felloes, an excellent material is found in guijo; it is not very heavy, but tough, difficult to split, and can be obtained in any size and quantity desired. In tropical countries, guijo withstands the weather better than hicory and would find use in the manufacture of spokes intended for use in the tropics. Malugai, which is a little lighter, but equally tough, is not as abundant as guijo, but can still be supplied in fair quantities.

The Cigar-box lumber par excellence of the world has for many years been the "Spanish cedar" of tropical America; in calantas is found a perfect substitute, so nearly identical in color, texture and odor as to be almost indistinguishable. It is the only native wood used in Manila for high-grade cigar boxes. For cheaper boxes several of the lauans and nato are used.

Shuttles and spindles must be hard, rather tough and resistant to abrasion. For these purposes a considerable supply of the sapwood of the trees of the camagon (persimmon) tribe could be furnished. Calamansanai and malabayabas are also recommended for trial in shuttles.

4. *Heavy Construction Timbers.*—A number of large trees furnish hard, strong and very durable construction timbers. It is scarcely probable that the United States market will seek any considerable quantities of such material, except for very special pieces of work; but three species at least are to be mentioned as furnishing a supply of magnificent posts or beams for all kinds of heavy wooden structures, namely, ipil, guijo and yakal. Allied to heavy construction is the use of timber for railway ties, durability and strength being the two qualities required. For this last purpose not only the three species above named are available, but at least twenty others are found, which, although they are not large enough or are not found in sufficient number to yield a great supply of large timbers, still can furnish ties for steam or electric railways. This statement refers, of course, to ties used without any preservative treatment. For treated ties, both the number of kinds and the supply available are much greater; practically all the lauans are very abundant and of great size and the majority are suscoptible to impregnation. Their mechanical properties are similar to the yellow pines (long leaf, short leaf and loblolly pines) of the United States. Beside the lauans, there are two harder woods available in great quantities, namely, guijo and Apitong. Apitong properly treated would make very superior ties in the tropics while in the temperate regions, it can be used untreated.

Following are brief descriptions and notes on some of the most important timbers of the Islands:—

Dipterocarp Family

TANGUILE (*Shorea polysperma*).—This is the best of the group so far as concerns grain, figure and hardness, though it has not the rich red color of red lauan.

RED LAUAN (*Shorea negrosensia*).—This, as its scientific name indicates, is most abundant in the island of Negros. It is one of the largest trees in the Islands, reaching sometimes a diameter of 7-ft. or over. Quarter-sawn, the wood has a beautiful ribbon grain which, with its red to dark reddish-brown color, has led to its being exported together with tangile and almon under the trade name of "Philippine mahogany," though it is not at all related to the mahogany family. Red lauan has been used in the last few years in great quantities for interior finish, high-grade furniture, cases of musical and scientific instruments.

TIAONG (*Shorea teysmanniana*).—This is intermediate in color and texture between mayapis and red lauan, being of a very uniform, light, glossy red. It is abundant in south-central Luzon, but very little, if any, comes to the Manila market, as no large operators have located in this region up to the present time.

MAYAPIS (*Shorea squamata*).—This is a very pale red lauan of straight-grained, smooth, glossy texture. It would make a very pretty veneer where a light red color is desired, but could also very readily be stained. It is less abundant than either red lauan or tangile.

WHITE LAUAN (*Pentacmo contorta*).—This is perhaps the most abundant and certainly the most widely distributed species of its family in the archipelago. The wood is whitish with light-gray, yellowish or very pale-brown tints. It is light, rather soft, with a fairly straight but slightly crossed grain, producing a narrow "ribbon" when quarter-sawn.

KALUNTI (*Shorea, Mindaneensis sp.*).—This is even lighter in color than white lauan and possibly a little softer and lighter in weight. It has not heretofore come into the Manila market in any great quantities nor under its own name it is found, as far as known, only in Mindanao and some of the adjacent smalerl islands.

(To be continued)

Douglas Fir Ties in China

ACCORDING to Canadian Trade Commissioner J. W. Ross, Douglas fir and Oregon pine have not yet been thoroughly tested for railroad tie purposes, and he refutes the claims made by Australian and Tasmanian lumber producers that hardwoods are preferable on account of their alleged longer life and resistance to dry rot. He says :

In my opinion Australian and Tasmanian hardwood is not likely to be extensively used for sleepers in railways in North and Central China in the future, any more than in the past, for the reasons which are given below. In the first place, it should be stated that neither Oregon pine nor Douglas fir sleepers have ever been used on Chinese railways to any extent, as the following statistics of imports will show. Accordingly the statement that they have a short life cannot be proved, for the reason that no extensive use of them has ever been made.

The following tables of imports of railway sleepers into China for 1913, 1919 and 1920 will show that neither Australia nor the United States nor Canada furnished any considerable quantity of sleepers to China, but that Japan received nearly the whole of the trade in each of these years :—

1913	Total imports	1,539,836 pieces
	Japan	1,444,540
	United States	14,621
	Australia	None
	Canada	None
1919	Total imports	1,521,706 pieces
	Japan	1,510,519
	United States	None
	Australia	None
	Canada	None
1920	Total imports	1,810,176 pieces
	Japan	1,710,350
	United States	64,946
	Australia	19,457
	Canada	None

The question may be asked, "Why is it that in these—as in all others for the past nine years—Japan has been the only country that has furnished railway sleepers to China in any great quantity ? and the reply is, entirely on account of the cost, Japan being able to supply the needs of China in sleepers at a price lower than they could be imported from any other country. Without doubt hardwood sleepers from any other source would be superior to and more desirable than untreated sleepers from Japan ; and this is why neither Australia nor the United States nor Canada have within recent years received any great share of the demand for sleepers for Chinese railways. The Chinese government railway administration have no great surplus of funds for any purpose, and whenever they are in the market for (say) 500,000 sleepers, they hesitate about paying $2,500,000 or more for the filling of the specification when the same quantity can be purchased for $1,000,000. From working statistics which have been prepared by competent railway engineers, the life of an untreated Douglas fir or Oregon pine sleeper on the railways of North and Central China is from five to seven years, and that of a creosoted pine sleeper from ten to twelve years, and of Jarrah wood from Australia fifteen years or more. A difference of opinion exists among railway officials as to which is the cheaper. A number contend that, although the initial cost is greater, the long service and infrequency of replacement make Jarrah wood, at three times the cost of Douglas fir, just as cheap in the long run. Others maintain that the high initial cost and interest on invested capital more than counterbalance the greater length of life of the sleepers.

Siamese Railways

At the present time the Siamese department of state railways has completed, or has under construction, the following length of line :—

	Completed Kilometres.	Under Constructions Kilometres.
Northern line (including the Korat, Petriu, and Sawankaloke lines—i.e., all the normal gauge lines)	950.5	78
Southern line (including branch lines)	1,301	44
North-Eastern line (Korat to Ubon)	—	100
Eastern Extension (from Petriu to Aran Pratet and the Cambodian frontier)	—	99
	2,251.5	321
	(1,407 miles)	(200 miles).

Survey work has been completed on the north-eastern line for a distance of 311 kilometres, and on the eastern extension for a distance of 119 kilometres, says the *L. and C. Express*. Rail-head on the northern line is now at Chiengmai, and on the southern line at the Golok river, the final terminus on the Kalantan border. Plate-laying has not yet commenced on the other two lines. Work is proceeding with the conversion from broad-gauge to metre gauge of the line between Bangkok and Korat. Conversion has already been effected on the line connecting Bangkok with Petriu. The metre gauge will in time be applied to the whole system of the country. Tenders haver ecently been invited by the department for the supply of superstructures for steel bridges and of bogie rail trucks.

Front View of the Mill

The "Great China" Cotton Mill at Shanghai

ANOTHER large cotton mill financed by Chinese capital held its formal opening on April 14 last. This was The " Great China " Mill, considered to be one of the best organized and equipped mills in the country. It was promoted in 1919 by Mr. C. C. Nieh, president of the Chinese chamber of commerce and managing director of the Heng Foong Cotton Manufacturing Company, Ltd., and Mr. E. R. Yin, a Harvard graduate.

The new mill property is situated on the north bank of the Wan Tsao Pang creek, and covers 149,811 *mow* of land. A few hundred yards away are the Whangpoo river and the Wan Tsao Pang railway station, making the location admirable as far as transportation is concerned.

The authorized capital of the company is Taels 2,000,000. Last year, the company purchased 11,000 spindles of American manufacture, with accessories, in addition to the 35,000 spindles of English manufacture already purchased. The present property of the company, including machinery, buildings, power plant, etc., represents an investment of Taels 2,800,000, an average of Taels 600,000 per 10,000 spindles. This cost is considered the cheapest among all of the newly established cotton mills in China.

The organization of the company is simple and efficient. Under the general manager and the assistant general manager are the general office and three departments, spinning, electricity and construction. The general office is subdivided into sections, such as correspondence, business accounting, store, warehouse, etc. Each department is headed with an expert, under whom are clerks and foremen. At the close of every day, reports are made by the clerks and foremen to their respective department heads, who in turn submit reports to the general manager and the assistant general manager. With this detailed information at hand, the managers can tell at a glance the working of the mill, the production, etc., and thus can shape their business policy accordingly.

A separate office is established in Shanghai, which buys cotton, sells yarn, and also keeps the important books of the company.

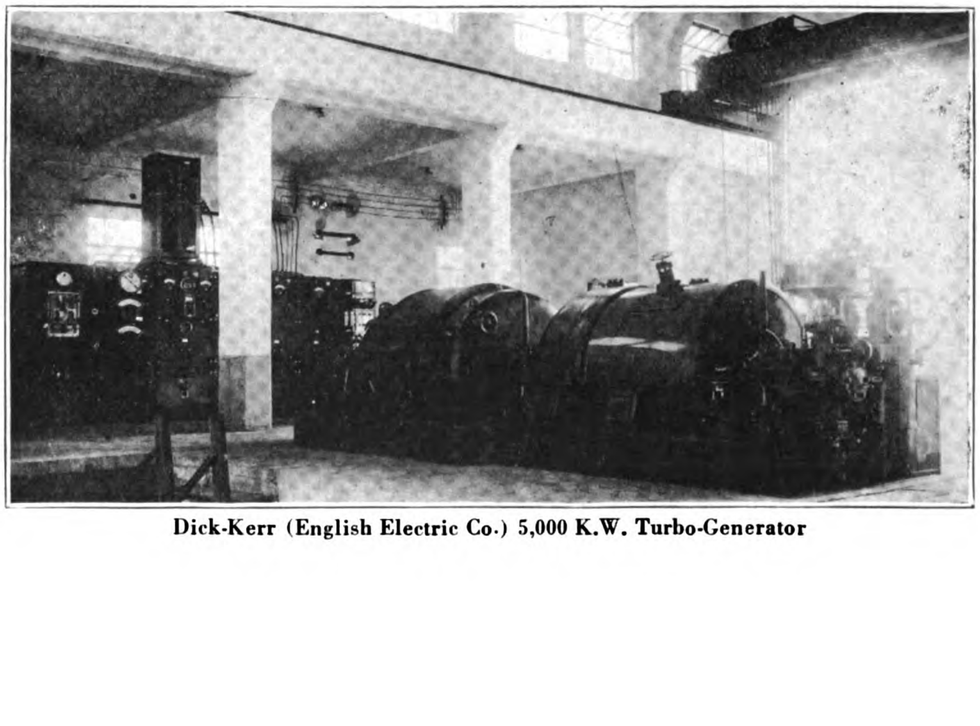
The mill produces yarns of 10 counts to 40 counts. With the most up-to-date machinery and modern appliances, operated by experienced hands, the result is a product excellent both in quality and appearance. This can well be testified by the fact that the yarn is welcomed by consumers and is enjoying a high market price.

The main mill, godown and power plant are tow-storied buildings of modern design in reinforced concrete, fire-proof construction. The main mill is 120-ft. wide and 700-ft. long and is well lighted with steel sash. The shop and office buildings are of modern design, built of brick and wood. The dormitory and lodging houses are Chinese style, built of brick and wood. The kitchen and dining room are Chinese style, built of bamboo and plaster. Special attention has also been paid to building roads, drive-ways, fences, drainage, etc., thereby enhancing the value and appearance of the mill.

The mill is equipped with 45,000 spindles spinning machinery, 11,000 of American manufacture, Saco Lowell make, and 35,000 of English design made by Messrs. Brooks, Doxey & Co. The machinery is run by electricity generated by two 1,000 K.W. turbo alternators, one of German make (Gorlitzer Maschinenbau) and one from the English Electric Company. The power plant consists of four Babcock and Wilcox boilers.

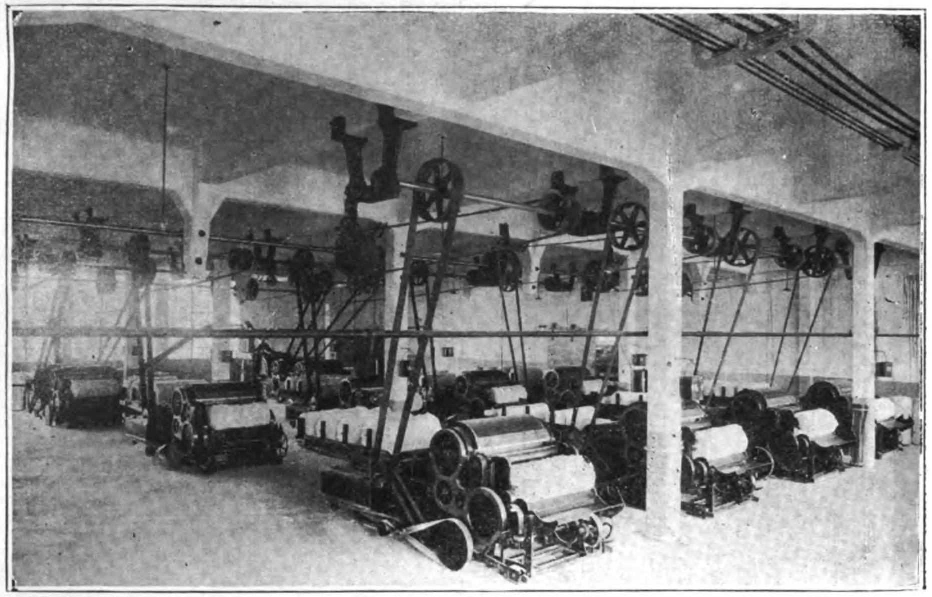
The mill employs about 2,000 laborers. Three-fourths of them are women workers. An employees' club was organized for the welfare of employees. A special reading room has been assigned to the club, in which are placed periodicals, commercial and industrial journals and all kinds of newspapers. Football teams, basketball teams, tennis teams, boxing teams, etc., have been organized. A weekly meeting is held at which employees are present and during which moving pictures and lectures are given.

The company's trade-mark is the map of the republic of China.

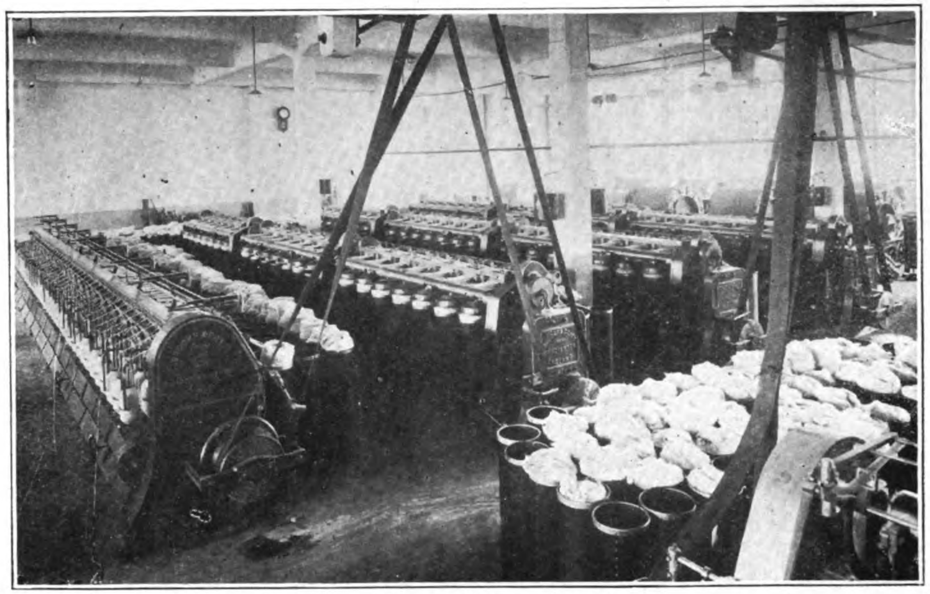


Dick-Kerr (English Electric Co.) 5,000 K.W. Turbo-Generator

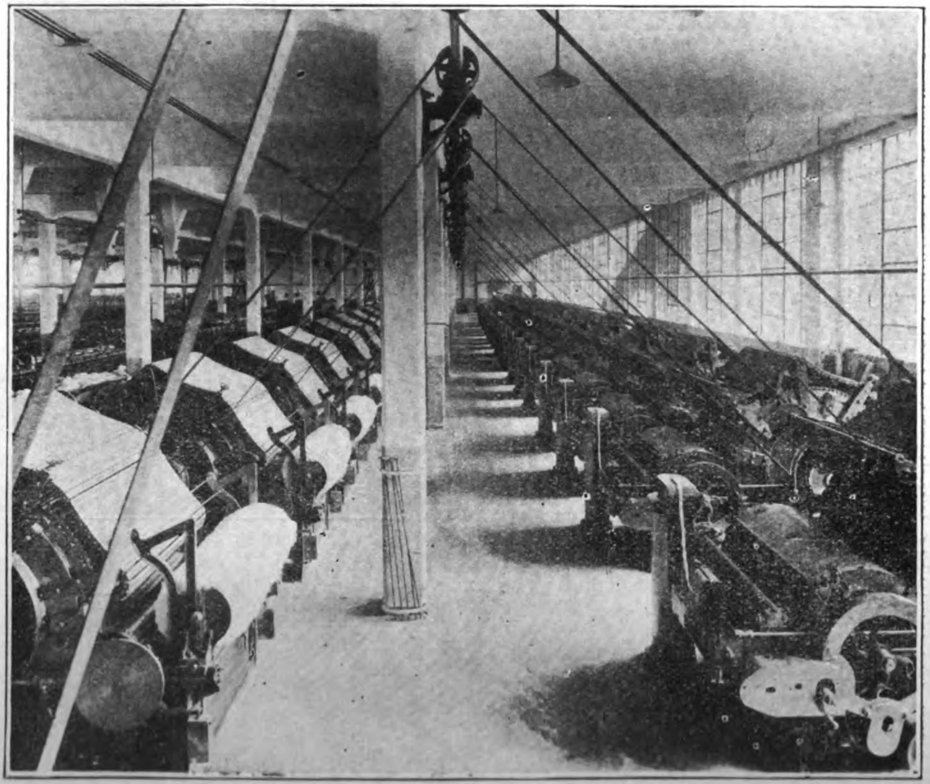
THE "GREAT CHINA" COTTON MILL



Scotching Machines



Brooks and Doxey Drawing Machines



Carding Machines

Reeling

Swiss Water Turbines in Asia

I. Japan

THE tremendous strides made by Japan during the last fifty years are a matter of common knowledge. Towards the end of last century, the need for power made itself felt, and the utilization of water power first thought of. The electrification of the railways is making great strides, and this explains the rapid construction of water power plants, especially in the vicinity of the great centres.

The projection and building of the plants has remained in the hands of Japanese firms, while it was found necessary to apply to foreign firms for the mechanical parts, as the home manufacture could not, supply the rapidly increasing needs of the country.

Of European firms, that of Escher Wyss & Co., Zurich, has supplied by far the greatest number of water turbines, viz., 260 turbines for 500,000 h.p., since 1900 to the end of September, 1920, and a further 40 turbines for about 125,000 h.p. are in course of execution. The total deliveries, therefore, comprise 300 turbines with about 625,000 h.p. output.

Japan called for large untis from the very beginning; turbines of less than 1,000 h.p. are rare. The average output of the turbines sent by Escher Wyss & Co. to Japan during the last twenty years amounts to close on 2,100 h.p., that of the turbines ordered in 1920, as much as 3,600 h.p.; among these there are units of 17,000 h.p.

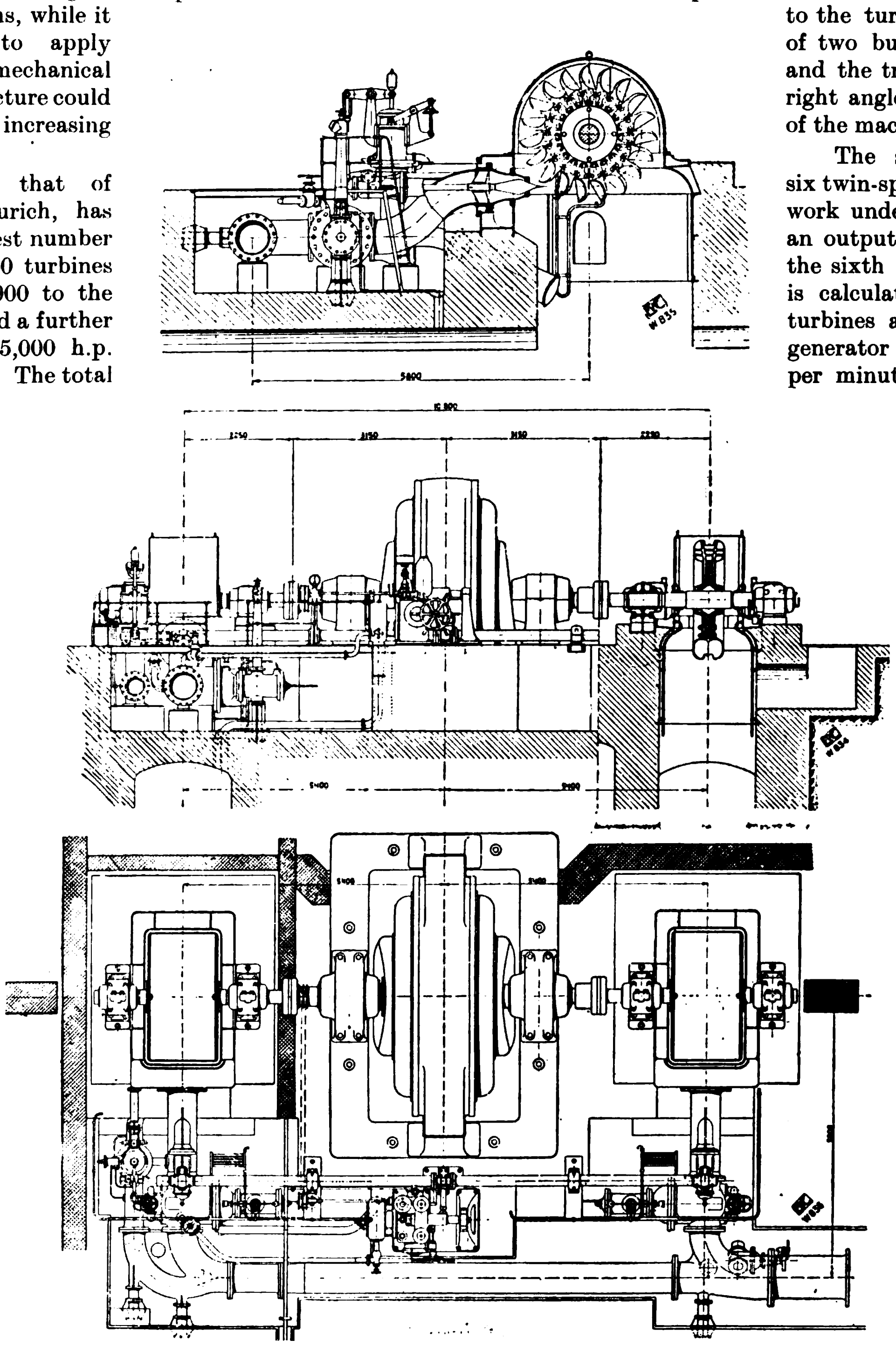
The configuration of Japan is exceedingly favorable for all sorts of waterfalls, and it may be said that up to now only falls of medium height have been utilized. There are practically no low-pressure plants, and high-pressure plants work with a maximum of falls of 300 to 400 metres: in other countries falls of 1,000 and more metres are utilized. Hence it is easy to understand that Francis spiral turbines are mostly used and that important power stations are equipped with these. We mention a few of these stations here. The greatest need for electric energy for lighting and power is at the capital, Tokyo. Several companies have undertaken to supply this power, so that in the last twelve years various large power stations have been built. Of these special mention may be made of the Tokyo Electric Light Co., the Katsuragawa Electric Power Co. and the Kinugawa Electric Power Co.

The first company opened a station of 27,000 h.p. on the river Katsura, 170 kilometres from Tokyo, in 1908. Fig. 2 gives a sectional view of the plant with the various pressure pipings leading to the turbines. The plant consists of two buildings, the machine hall and the transformer house built at right angles to the upper face wall of the machine house.

The station is equipped with six twin-spiral turbines, five of which work under a fall of 95.5 m., with an output of 4,500 h.p. each, while the sixth (which was supplied later) is calculated for 4,950 h.p. These turbines are coupled direct to the generator and make 500 revolutions per minute. The division into six groups with a comparatively small output was caused by the difficult transport conditions.

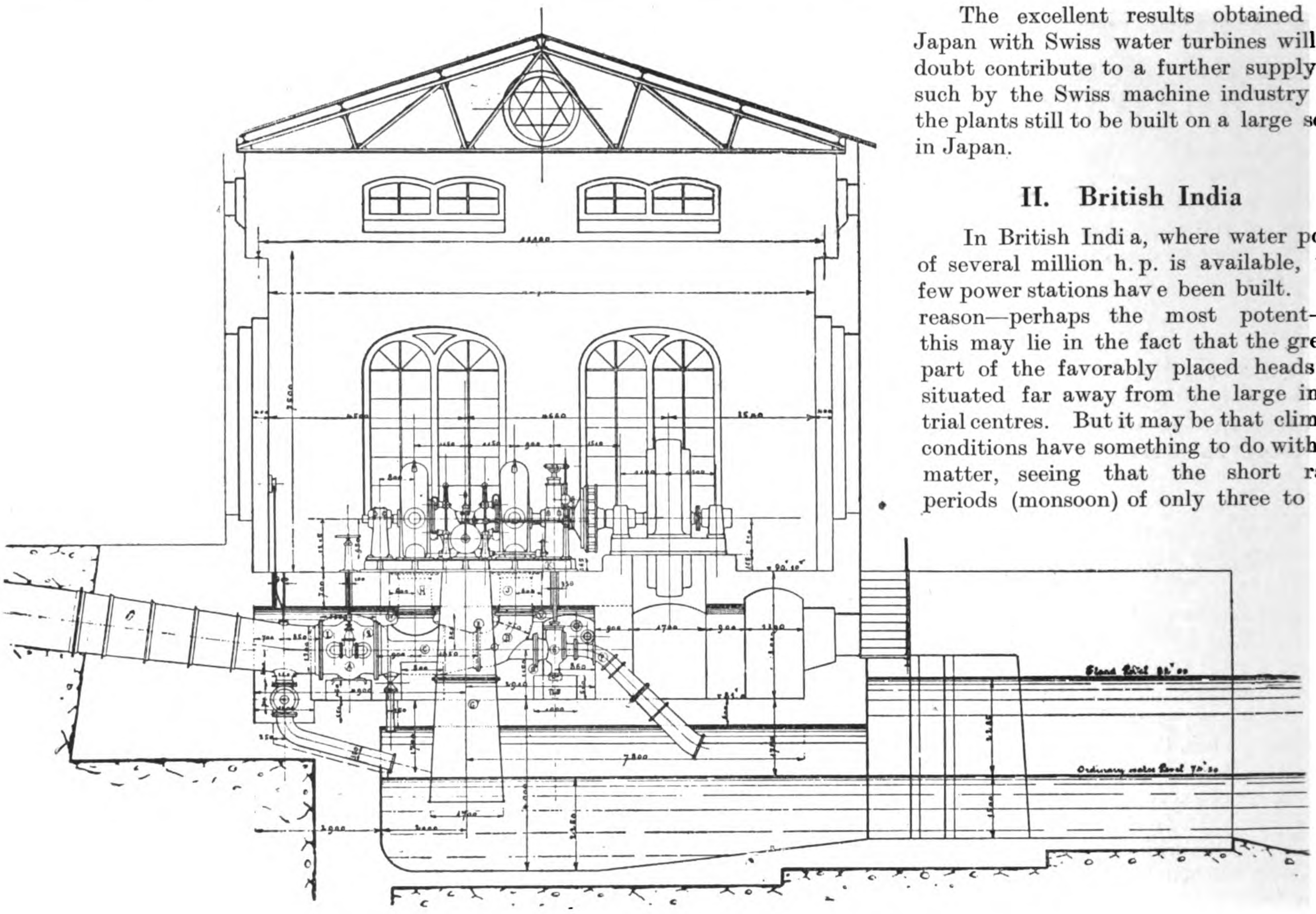
The second station built by the same company on the same river in the years 1910 to 1912, already exhibits larger units of a maximum output of 12,500 h.p. In normal work, five turbines together supply 50,000 h.p., the sixth turbine being kept in reserve. The net head fluctuates between 112 and 120.5 m. Large twin-spiral turbines were likewise chosen for this station so as to avoid too large dimensions on the one hand, and, on the other, to obtain a higher number of revolutions by employing two runners. Fig. 1 shows the plan, elevation and section of the turbines installed in this plant.

The general arrangement of the engine house is seen by Fig. 1, together with the pressure conduit of about 215 metres length, the diameter of which is 1,860 mm. in the upper



Plan, elevation and section of an electro-generating set with two tangential wheels, universal oil-pressure governor, and relief valve, supplied to the Kinugawa Co. in Japan by Escher Wyss & Co.

6 large Turbines aggregating 81,000 H.P. 2 small Turbines aggregating 1,800 H.P. Head 320 m.



Sectional view of the Kinugawa Hydro-Electric Power House

zone and diminishes to 1,650 mm. in the lower. The whole turbine house had to be built underground in order to gain head by the construction of a long tail race. The transformer house, however, was built on the surface.

The Katsuragawa Electric Power Co. have two stations, the second of which is fitted up with turbines supplied by Escher Wyss & Co. in 1919. The station contains four groups of 9,200 h.p. each for a head of 114 to 117 m.

A considerable difference from the other power stations mentioned, lies in the vertical arrangement of the shafts, a state of things occasioned by the extremely intense fluctuations of the level of the tail race, so that it was found desirable to place the generator above the highest level, an operation which was only possible by using vertical shafts.

The same arrangement was made for the three turbines lately ordered for the plant of the Ujigawa Hydro-Electric Co., which supplies the town of Osaka with electricity. With a head of 45 m. each unit is to produce an output of 17,000 h.p. These will be the largest turbines in Japan.

To return to the Tokyo power stations. The plant of the Kinugawa Electric Power Co. is the only large high-pressure station in Japan. It was built in the years 1911 to 1912. The head of 320 metres is one of the highest in the country used for this purpose. Six generators of 12,500 h.p. each are coupled directly on both sides with tangential wheels. Another high-pressure power station may be mentioned in connection with the above, viz., that carried out on a southern island by the town of Kumamoto. The head here is 240 m. and the water is conveyed in pipes of 850 m. length to the four tangential wheels of 2,700 h.p.

Finally, we may mention the central at Kidzugawa, which has two groups of 2,700 h.p. each for a head of 22.25 m.

The excellent results obtained by Japan with Swiss water turbines will no doubt contribute to a further supply of such by the Swiss machine industry for the plants still to be built on a large scale in Japan.

II. British India

In British Indi a, where water power of several million h. p. is available, very few power stations hav e been built. One reason—perhaps the most potent—for this may lie in the fact that the greater part of the favorably placed heads are situated far away from the large industrial centres. But it may be that climatic conditions have something to do with the matter, seeing that the short rainy periods (monsoon) of only three to four months annually, make the construction of huge reservoirs an imperative necessity if a constant supply of water for feeding the power stations is to be secured the whole year round.

In this respect, the Tata Hydro-Electric Power Supply Co., Ltd., Bombay, have set an excellent example by constructing a great number of reservoirs by means of which they intend to obtain a very high degree of power. For the time being the power station near Khopoli, which commenced operations about five to six years ago, is supplying power to Bombay at an approximate distance of 70 kilometres. A second plant is in building.

Both the turbines and the conduits for the first plant at Khopoli were supplied by Escher Wyss & Co., Zurich.

The building of dams made it possible to bank up the water into three large lakes, the combined volume of which is 280 million cubic metres. The water is conveyed to the water chamber by an open canal of 7 kilometres' length. The water transverse section of this canal has been so calculated that the maximum of water flowing through is sufficient to obtain an output of 120,000 h.p.

For the time being, a pressure conduit of 2.5 kilometres' length, with diameters of 2,100 to 1,800 mm., leads from the water chamber to the distributing pipe, where the branching-off takes place in four further pipes of 1.4 km. length each and a diameter of 1,070 to 960 mm., each of which feeds a turbine of 13,500 h.p. The net head is 505 metres, which means that only tangential wheels are used. Owing to the height of the head and the large output, these wheels must be made entirely of cast steel. The water jets necessary for supplying the power are amongst the largest ever used till now, being 190 mm. in diameter.

The turbines are coupled direct to generators with 300 revolutions a minute, producing an alternating current of 5,000 volts; this is stepped up to 100,000 volts and conveyed in conduits of 70

km. length to Bombay, where the power is chiefly used for spinning mills.

Among other Indian plants are the power station at Cauvery Falls, built by the government of Mysore. Since 1900, 14 tangential wheels have been fitted up there, the output of which varies between 1,250 and 2,700 h.p. with a head of 120 m. The turbine supplied last year by Escher Wyss & Co., Zurich, will develop 5,600 h.p. This is a Francis turbine, as, of recent times the use of these for heads of over 100 metres is nothing extraordinary. Escher Wyss & Co. have further supplied a number of smaller turbines to British India.

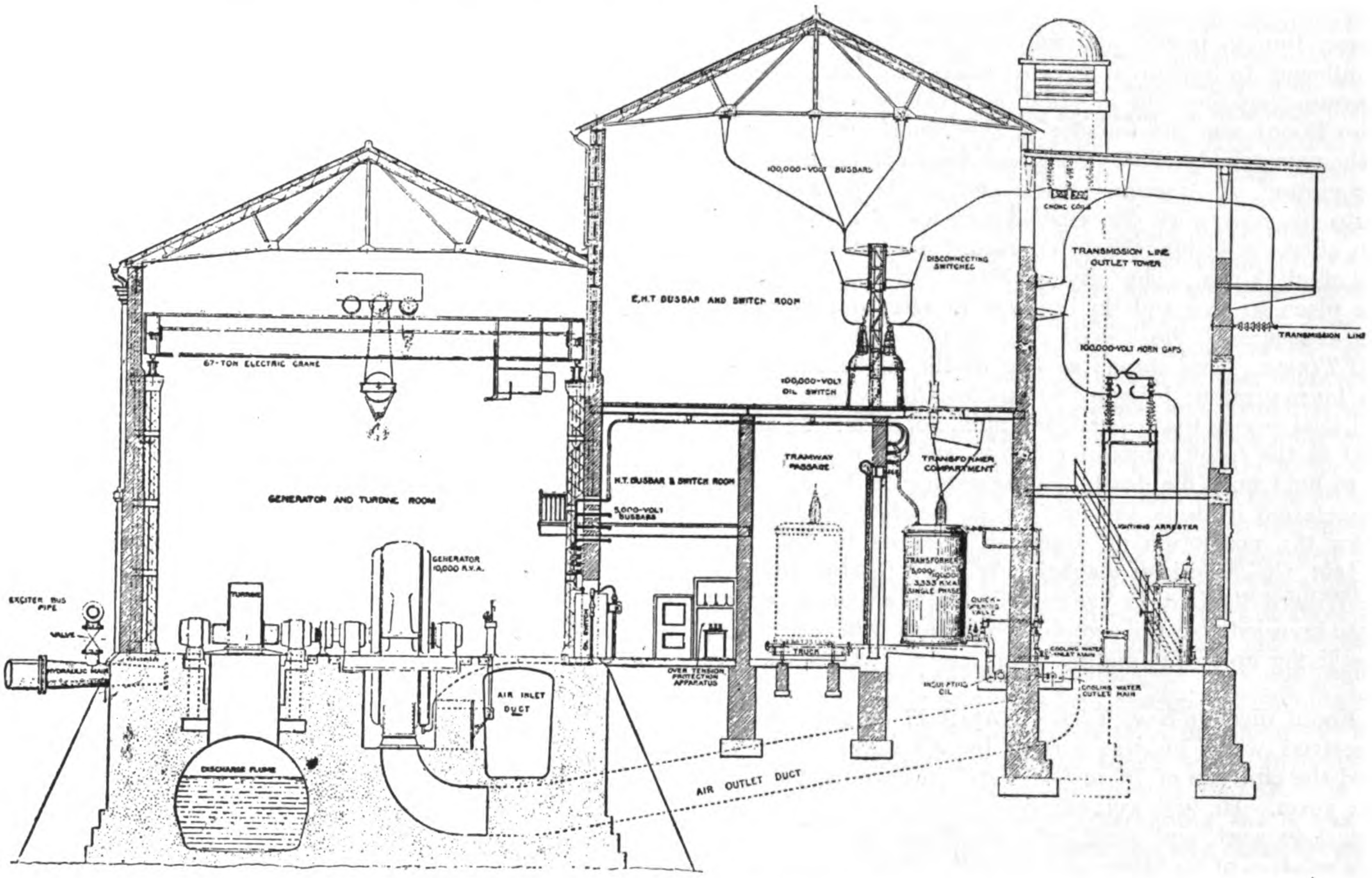
III. Dutch East Indies

In the Dutch Indies, especially in Java, there were about 30 plants fitted with turbines up to 1,500 h.p. The government is now building two power stations, viz., Tjisaroewa and Tjikapoendoeng, for which Escher Wyss & Co. are supplying five turbines of 1,500 h.p. each, with 750 revolutions per minute, three for a head of 86 m. and two for one of 104 m.

IV. New Zealand

Another land in the South Seas which has given the above firm big orders is New Zealand. Side by side with a large number of small stations, we may mention the power station at Lake Coleridge which has a head of 140 m. and which, when first built in 1912, had three units of 2,750 h.p. each with 500 revolutions. A further and similar group was supplied in 1915, but owing to the lack of power which manifested itself already in 1916, it was determined to build in a larger unit of 5,750 h.p. to which a further group of the same size will shortly be added.

These short notes will have sufficed to show the importance of the supply of water turbines for the big power stations of the Far East, and at the same time indicate the efficiency of Swiss manufacturers.



Sectional Elevation of the Khopoli Power House of the Tata Hydro-Electric Supply Company supplying light and power to Bombay. Equipped with eight sets of Escher Wyss hydraulic impulse turbines of the horizontal type (13,500 B.H.P. each) direct coupled to Siemens Brothers 3-phase generators

Railway Electrification in Japan

PLANS to electrify the Tokyo-Yokosuka and the Tokyo-Odawara lines are now ready to be carried out, having been signed by the minister of railways. According to a detailed account of the scheme, the new undertaking is to be fully completed by the end of the year. The cost of this project is estimated at Y.14,-378,000, which the government railways of Japan is now authorized to defray out of its repairs and improvement credits.

Trains of eight cars each on the present tracks between Tokyo and Yokosuka and Tokyo and Odawara will be in operation when the lines are completed. On the Tokyo-Kozu line express or direct passenger trains are to be run with electric locomotives. The freight trains are also to be run with electric locomotives. On shunting tracks and in repair shops steam locomotives are to be used.

Electric power for this equipment will be 1,500 volts, but on the urban section the voltage is to be limited to 1,200 volts. Direct current transformer stations are to be erected near Yokohama, Ofuna and Ninomiya, the old stations to be used in supplying power to the section between Tokyo and Yokohama. The power required is to be supplied by the government plant that is soon to be completed at Akabane. Tokyo Electric Light Company is to be drawn upon in emergencies.

Eight electric locomotives have been ordered from British and American locomotive works. Thirty more engines, 60 electric cars and 90 trailers are to be built within the next two years. New sheds will be built near Kamata and Takashima-cho stations.

The Far Eastern Review

A Monthly Review of Far Eastern Trade, Finance and Engineering, Dedicated to the Industrial Development and advancement of Trade in Far Eastern Countries

ENGINEERING FINANCE COMMERCE

5 JINKEE ROAD, SHANGHAI, CHINA

Telegraphic Address: Farview, Shanghai

SHANGHAI, JUNE, 1922.

John Foord

WITH the death of John Foord, Americans in the Far East have lost the pioneer who was first to recognize, in 1898, the effect of European policies upon future American trade in China, and who brought together the leading American merchants into an association to protect national interests in Eastern Asia and bring influence to bear upon the government to take necessary action to assure that the door to equal opportunity would remain open. John Foord was the founder of the American Asiatic Association, the parent body of all subsequent American organizations for the promotion of American trade and ideals in Asia. He brought into his new work the ripe experience of a life-time of journalistic effort, a brilliant fighting record against shams and corruption of all kinds. The city of New York was a cleaner and better place to live and do business in after John Foord's memorable exposure of the Tweed ring in the columns of the *New York Times*. This stands as one of the highest examples of fearless journalism in bringing to justice the most notorious gang of political crooks that ever defied public opinion. It placed John Foord in the front ranks of political writers, a position he continued to hold until his death. As secretary of the American Asiatic Association he took the lead in all legislative and other activities for the promotion of American interests in Asia. As editor of *Asia*, the American magazine on the Orient, founded by the late Willard Straight, he has contributed to a more profound and accurate knowledge of the complex problems of this continent, at all times living up to the highest traditions and ethics of journalism.

John Foord died in New York on April 17 as the result of injuries received when he was struck by an automobile. He had reached the ripe age of 78, and was still in harness, young in spite of his years. He had well earned his rest many years ago, but continued to work and contribute his efforts to bring about an amicable solution of problems that he well realized might otherwise lead to hostilities. To those of us of a past generation who have worked with him and shared his fights for a square deal to all Asiatic peoples and promote harmony and better relations between America, Japan and China, his loss is well nigh irreparable. Americans in Asia have lost a faithful friend, stalwart champion. There are few indeed with the ripe knowledge of Far Eastern affairs to take his place in the council chambers of the various organizations that exist for the promotion of American interests and ideals in Asia.

The *New York Times* pays him the following eloquent and fitting tribute:—

John Foord devoted a long life-time to journalism. In the beginning his field was the general news of the day. Later he turned to editing, still in the daily field, and finally his interests and his labors concentrated on the Far East, so that he will be most immediately remembered as editor of *Asia*, as one of the founders of India House and as the organizer of the American Asiatic Association.

But very many years before he had brought his gifts of clear-sightedness, a sense of fair play and an ability for forcible expression to bear for the good of Japanese and Chinese, he was devoting them to municipal affairs, then of transcendental concern to New York.

Born in Perthshire, Scotland, on October 12, 1844, he was educated in Dundee and spent his young manhood in the service of newspapers in London. The opportunities of a new world appealed to him, however, and in 1869 he became a reporter on *The New York Times*. He hardly was launched on his new career when *The Times* began its historic and in the end successful fight to break the Tweed ring. To his pen fell the task of analyzing the evidences of fraud in the books of controller connolly. The fight against tweed, inevitably, was not won at once, but to Foord's masterly handling of that opening assault always has been attributed a large share in the eventual success of the battle.

The Tweed exposures were Foord's greatest news job. Soon after he turned to writing editorials, displaying a wide grasp of affairs and proving particularly able in what he had to say on financial and commercial topics.

In 1876 Mr. Foord became editor-in-chief of *The Times*, then still a republican newspaper. He held that position until 1883 with unwavering adherence to the interests of the public and an unselfish and kindly modesty that leave him affectionately remembered by those of his associates who remain.

From *The Times* he went to The Brooklyn Union, of which he became editor and part owner. Next he edited *Harper's Weekly*. For the last twenty years he was a member of the editorial staff of *The Journal of Commerce*, devoting himself to economics and international topics. His editorials on Far Eastern subjects were stamped particularly as authoritative because of his sympathetic interest in those lands, his travel and his broad reading. In the summer and fall of 1920, while in the Orient, he returned once more to the columns of this newspaper, contributing a series of signed articles on his observations.

As a pioneer among broad-spirited Americans in the last generation Foord worked for fair and liberal dealing with the peoples of China and Japan. The growth of his interest in the Orient led him naturally to the formation in 1898 of the American Asiatic Association.

It was at this time that German and Russian aggression upon Asia was threatening Chinese and American rights therein. The association was formed as a protest against this encroachment. Under Mr. Foord's secretaryship the association since then has steadily made its infuence felt for the liberalization of all our treaties and economic relations with the Far East.

Mr. Foord was the founder and editor of the Journal of the American Asiatic Association, published from 1898 until 1917. In that year the late Willard Straight, who was president of the American Asiatic Association, agreed to finance the development of the journal into a broad general popular magazine, and he and John Foord united in organizing *Asia*, with Foord as editor.

In 1914, Mr. Foord joined with James A. Farrell, president of the United States Steel Corporation, the late Willard Straight and Robert H. Patchin in organizing the National Foreign Trade Council, and a little while later Mr. Foord was one of those associated with Willard Straight in the founding of India House. His speech responding to the toast "Why India House ?" at the first dinner of the club lives as a classic in the minds of its members, and has been carried all over the world by American traders, bankers and diplomats.

Mr. Foord was a thorough American also, of broad public spirit. He was very proud of his Scotch ancestry, of Scotch achievement, throughout the world. He was for many years president of the Burns Society, and invariably responded to the toast "The Immortal Memory" at the annual dinner. He wrote the foreword in the recent book "Scotland's Mark," published as a record of Scotch influence in America in connection with the celebration a while ago of "America's Making." Mr. Foord wrote the life of Andrew H. Green, one of the factors in city government in cleaning up the Tweed ring; the life of Simon Stern, eminent lawyer and at one time president of the Bar Association; *The New York Times Jubilee Supplement*, which chronicled the history of fifty years of this newspaper.

* * *

Japan and the Gentleman's Agreement

By Warren Ryder

THERE is a saying that if one tells a story often enough it will be accepted finally as true even by the teller no matter how little foundation in fact actually it may have. Generally speaking this saying is correct, and proof of its correctness, if otherwise lacking, may be found in the belief that has grown up concerning Japan and the gentleman's agreement. So often and so widely has Japan been accused of the violation of the terms of this agreement that the general public almost without exception has come thoroughly to believe the accusation without, of course, having recourse to any inquiry, investigation or statistical data that would tend to establish the facts.

Another factor in creating belief in this accusation has been the general public's almost complete lack of understanding of the terms and intent of the gentleman's agreement, which it has ignorantly regarded as some sort of an exclusion plan contemplating the preclusion of all Japanese immigration to America. Holding such an opinion, while observing the constant coming of Japanese to America, the public has been lead inevitably to the conclusion that Japan has not kept her promise, that she has been guilty of bad faith.

It seems well, therefore, and desirable to investigate in order to ascertain and announce the facts, but first of all to set forth as clearly as possible the terms of this much mentioned and abused

agreement, as well as a brief statement of the circumstances that lead to its adoption.

The gentleman's agreement, as it commonly has come to be called, resulted indirectly from an anti-Japanese agitation in California, and to some extent in other sections of the Pacific coast, which demanded a cessation of the immigration of Japanese laborers to America. It is not in any legal sense a formal treaty or agreement, and the term applies merely to the substance of a number of informal notes, exchanged in 1907 between secretary of state, Root, and Ambassador Takahira, of Japan, discussing the subject of the regulation and control of Japanese immigration to America, and culminating in an understanding by the terms of which Japan pledged herself upon her honor as a nation to limit the issuance of passports to such of her subjects seeking to go to continental United States as fell within the following designated classes, namely :—

(1) Non-laborers ;
(2) Former residents ;
(3) Parents, wives or children of residents and
(4) Settled agriculturists.

The first class embraced only non-laborers, such as merchants, diplomats, professional men, financiers, students, travellers; and so forth, who, as before, were permitted to come and go at will. The second class embraced any Japanese, non-laborer or laborer, who sought to come to continental United States to resume a formerly acquired domicile ; in other words, any Japanese who had already become a resident of America but who had returned, or in the future might return, to Japan for a visit. The third class comprised exactly what it states, namely, the parents, wives or children of residents, firmly granting the right, therefore, of a Japanese resident of America to send to Japan for his wife, parents or children. The fourth class related to such Japanese as had already invested in farms or other agricultural enterprises in this country and who, desiring to assume active charge of such farms or enterprises, were granted the right of entry into America and have come to be referred to as "settled agriculturists." Also, Japan, of her own accord, agreed to deny passports to Japanese laborers desiring to enter territory contiguous to continental United States, such as Mexico and Canada.

From this it will be seen that while the gentleman's agreement did rigorously restrict, it did not contemplate or seek to secure the total preclusion of Japanese immigration to America and, therefore, did not amount to an exclusion act ; nor has it ever been so regarded by those informed upon the subject.

Thus having established the history, the terms and the intent of the agreement, the next step is to ascertain if—as so frequently charged—it has been violated by Japan. Regard for the facts compels the emphatic declaration that it HAS NOT, for, despite all the assertions of the anti-Japanese propagandists, I am unable to find in any of the reports of the United States commissioner general of immigration a single case wherein Japan has been shown to be guilty of any violation, but do find, upon the contrary, in these reports and in statements emanating from other official sources that she has kept the terms of the agreement. The 1919 report of the United States commissioner general of immigration makes the following statement :—" It will be remembered that the passport agreement, which was made in 1907, provides, in effect, that Japan will not issue passports good for continental United States to laborers, unless such laborers are coming to resume a formerly acquired domicile, to join a parent, husband or children, or to assume active control of an already possessed interest in a farming enterprise in America. While the agreement relates only to immigration to continental United States, Japan soon voluntarily extended the same provisions to the movement to Hawaii, so that in effect all immigration of Japanese laborers is subject to its terms. Non-laborers, of course, are not affected and are free to come and go under the same conditions which obtain in the case of aliens of other nationalities." Also, we find the acting secretary of state, Mr. William Phillips, saying in a letter to Hon. James D. Phelan, under date of August 28, 1919, that :

" Adverting to your letter of July 24, relative to the so-called 'gentleman's agreement' between this government and the government of Japan for regulating the immigration of Japanese to the United States, I have the honor to say that, after giving due consideration to certain facts and figures recently obtained from the honorable the secretary of labor, I have confirmed the opinion which I have held for some time on this subject ; that is, that the present arrangement is working with a fair degree of satisfaction, with the possible exception of the immigration of so-called Japanese 'picture brides' to the United States." And in concluding the letter, Mr. Phillips says : " The number of Japanese wives coming to the United States is undoubtedly increasing but the authorities who have in charge the administration of the immigration laws have not found that the Japanese government is violating the agreement." Thus we find officials whose duty it is to know, and who have every means of knowing, stating in substance that Japan has kept the terms of the gentleman's agreement. Furthermore, the congressional committee on immigration and naturalization, has just concluded a series of hearings in California and, Washington in which every phase of the Japanese situation was fully investigated and, during these hearings at which the most prominent anti-Japanese workers appeared and testified under oath, not a particle of proof, or a scintilla of such evidence as would be accepted in a court of justice, did I hear or find to show that Japan in any instance had violated the terms of this agreement. What must be the significance of this failure to furnish proof ? What must it mean ? It must signify and it must mean, it seems to me, that no proof of Japan's violation of the gentleman's agreement was furnished BECAUSE NO SUCH PROOF EXISTED ; BECAUSE NO SUCH VIOLATIONS HAD TAKEN PLACE. And it would seem to mean, also, that another of the grave charges made against the government of Japan had been predicated not upon fact but rather upon ignorance and misunderstanding.

The problem arising out of the Japanese question is a serious one. A satisfactory solution of it is greatly to be desired. But no solution satisfactory or lasting can result from an agitation that finds its chief inspiration, I believe, in race prejudice and intolerance or from a consideration that is not preceded by and based upon the fullest and fairest investigation. There has been altogether too much of a tendency upon the part of those opposing the Japanese to exercise snap judgment in the matter, to make statements without thorough investigation. Some individual, sincerely interested and no doubt desirous of giving aid to the settlement of the problem, spends three or four weeks in Japan and returns to assert a deep and fundamental understanding of the whole Japanese question, and to warn that there is grave danger of the Japanese presently overrunning the whole of America. Some other individual proceeds leisurely down through California to the Mexican border and then announces, without submitting anything by way of definite proof, that thousands of Japanese are being smuggled into California with the connivance of the Japanese government, and that if California and America are to remain white the Japanese must go. And then other individuals, whose sincerity in the premises I am not here questioning, take alarm and map out a campaign to secure legislation to exclude further Japanese from America, and to deny the fruits of their toil to those already here and the right of citizenship to their American-born children. It seems most unfortunate that this kind of activity should characterize California's contribution to the solution of the Japanese problem.

* * *

The Chinese Eastern Railway

By Shao Ying T. C. Yeh

(Out of the mass of publicity matter circulated in the United States by the Chinese delegation during the Washington conference, the following presentation of China's side of the case in the matter of control over the Chinese Eastern Railway is of special interest and value).

THE construction of this railway was undertaken in pursuance to the agreement reached between the government of China and the Russo-Chinese Bank in 1896. Under the provisions

stipulated therein, it was agreed that "China and Russia establish a company to be called the Chinese Eastern Railway Company to construct and manage this railway." "The shares may be bought only by Chinese and Russians. In the imperial sanction given to the Chinese envoy empowering him to negotiate the matter, the company was accorded concessions, privileges and facilities, in return for which the company was to pay to the Chinese Government five million treasury taels on the day the line is completed and traffic commenced." The line was to remain the property of the company for eighty years from commencement of traffic, at the end of which it would revert to the Chinese government without payment. China is given, however, an option to take it over at the end of thirty-six years on payment of all capital, debts and interest owed by the company and undistributed profits, if any.

During the disturbances of 1918, allied forces were sent to Siberia to maintain order and assist in the evacuation of the Czecho-Slovaks there. To facilitate the evacuation, and inter-allied commission was created to take over the administration of the line. This arrangement provided for a technical board and a military transport board comprising of a representative from every nation that had a force there,—including one from the Russian government, which issued a declaration in approval of the arrangement—Both in this declaration and in the one issued by the allied representatives, emphasis was laid on the fact that, in doing so, it only intended to facilitate and improve the railway, and no violation of Russian sovereignty was contemplated. Although stipulation was made for the dissolution of this body upon the withdrawal of the allied forces, the railway is still under its management to-day.

A careful study of the relation between the company and the Russian imperial government clearly shows the political rôle of this railway with the inevitable disadvantageous results to its commercial standing. The losses were at first made good by the funds of the Russian government, but when the Bolshevik *coup d'etat* did away with the board of directors of the company at Petrograd, it was deprived of the only financial prop on which the company has been relying. The result was disastrous. This was further aggravated, first by the political interest of some of the directors such as General Horvath and Vice-Admiral Kolbchak, then by the enormous depreciation of the rouble and lastly, but not the least, by the struggle of the various political factions in Eastern Siberia and the consequent disorder along the line, a natural result of guerrilla warfare.

Such strifes were not only detrimental to the Russians themselves but were gradually affecting the safety of the Chinese. China suffered under this state of affairs as long as it was compatible with her own duty towards her subjects. The time came at last when any further inaction on her part would endanger her own security, and after consulting her allies she joined them in sending an expeditionary force into Siberia to assist in maintaining some sort of order there.

When the inter-allied commission came into existence, China opposed the inclusion of the Chinese Eastern Railway under its administration. The protest, however, failed to have any effect.

The reasons on which China based her claims for the sole administration of this railway can be summarized as follows :

(1) The line is on Chinese territory. The lands through which the line runs and the adjacent land are grants to the Chinese Eastern Railway Company by the Chinese government, free of charge. It is, therefore, only just that its administration by any other party besides Russia, to whom China is bound by treaty, can only be interpreted by China as derogatory to her territorial integrity.

(2) China is one of the two principal shareholders. By virtue of the agreement of 1896, "Russians and Chinese only can be shareholders." As a matter of fact, the Russo-Asiatic Bank remains the sole shareholder of this company with the exception of very few individual shares. But this bank is a joint Chinese and Russian concern, the former having subscribed and paid up the sum of Tls. 5,000,000.

(3) China is a creditor of the company. According to the agreement of 1896 the company was to pay to the Chinese government the sum of Tls. 5,000,000 in return for the land granted to the company by the Chinese government. This, for some reason or other was never carried out, and together with interest it now amounts to something like Tls. 11,000,000.

(4) By the agreement of October 2, 1920, signed between the Russo-Asiatic Bank and the ministry of communications, it was stipulated that, pending an agreement between the Chinese government and the future Russian government recognized by China, China will assume the control over its administration in order to give it efficient protection. China therefore, is in honor bound to make good the promise she has given to the bank.

(5) Since the Chinese assumed control of the railway its financial conditions have been greatly improved. Instead of relying upon Russian government subsidies to make up its enormous deficit as had been hitherto the case, the revenues and expenditures are now almost balanced.

In claiming administration over this railway, China is not only actuated by her own interests but also by consideration for the welfare of the company. This can be easily proved by a careful study of the agreement of 1920, a provisional understanding pending the constitution of a recognized Russian government. It contains no special derogations of the statutes of the railway company as of the 1896 contract, which were confirmed. To guard against possible abuse it contained a special clause confining the activities of this line to those of a purely commercial character. All these facts demonstrate clearly that, beyond protecting her own and the company's interests, China has no intention to take advantage of the present Russian situation, although it would be quite justifiable, seeing that the Tls. 5,000,000 to be paid by the company stipulated in the original agreement was never paid up.

As soon as a stable government is established in Russia that can take over the rôle now forced on China, negotiations for a settlement will no doubt be arranged at the first favorable opportunity. The matter in short, is one between China and Russia and to be settled between these two countries when China can find a recognized government to deal with in Russia. That this is clearly acknowledged by Russia herself can be seen from the aforesaid agreement.

It may be added here that the inter-allied commission was called into existence by reason of military exigencies. Now that all the allies except Japan have seen fit to withdraw their forces, it has outlived its usefulness. Why not dissolve it and prove to the Russians as well as the Chinese the good faith of the allies as stated in their declaration in 1918 ? To the Russians, this will mean the fulfilment of a promise eagerly awaited ; to the Chinese, its termination will mean the ending of what has always been considered a gross violation of their administrative integrity and territorial sovereignty.

In view of the above considerations, China is prepared to bear on her own shoulders the whole burden and responsibility of continuing to maintain the efficient administration of the railway as long as Russia is not in a position to do her share. Any interference on the part of others will be, therefore, not only unjustifiable, but detrimental to its continual smooth working. We have not the slightest doubt that such a course of action will be met with the disapproval, not only of the Chinese, but also of the Russians, whose interests China is bound by treaty to uphold and protect.

SHAO YING T. C. YEH.

* * *

The latest financial report of the Chinese Eastern Railway under the presidency of Dr. C. C. Wang, indicates that the financial stringency of the line has been much eased owing to payments made by the various powers for services rendered during the war and post-war period. In effect, the railway showed a net profit

of more than $2,000,000 for 1921 after paying for many improvements. According to the latest reports, the amounts owed by the powers to the railway are as follows :

Country	*Original amount owed*	*Outstanding*
Japan..	$6,544,249	$247,874
Great Britain	358,016	48,565
U. S. A.	659,310	91,451
(American merchants)	469,376	469,376
France	452,690	452,690
China	182,177	182,177
Italy ..	56,759	10,115
Czecho-Slovakia	3,477,650	3,477,650
Others	273,334	273,334
Total	$ 12,473,561	$5,253,232

* * *

The Value of an Ounce of Gold?

IN 1913, Dr. Sun Yat-sen damaged his political career in China by advocating a currency scheme guaranteed by merchandise and the products of the country stored in government warehouses. Overnight, he fell from the pinnacle of fame into a padded cell. Ten years later, the total gold reserves of the world are computed at $5,000,000,000, of which, sixty per cent. is in possession of the United States with the inter-allied nations in her debt to the tune of $19,000,000,000. With the gold mines of the world closed down because it is now unprofitable to work them, and with only about a dozen mines with ore reserves ahead of them for twenty years, with the United States draining the world of its gold in payment of debts, the question must arise of how these debts are to be paid. Obviously, if they cannot be paid in gold, if paid at all, they must be paid in commodities, which in turn must have a fixed value.

Now comes Thomas A. Edison and asks the simple question : "what in your opinion would be the approximate market value of a troy ounce of pure gold if all the governments of the world should demonitize it ? "

What is the answer ? What regulates the price of gold ? The current belief is that gold is subject to the law of supply and demand the same as other commodities, or that an ounce of gold is worth a certain price because it costs just so much to produce it. The price of pure gold is $20.67 per troy ounce, simply because the nations of the world have fixed that price as standard. Nothing more, nothing less. Gold in itself is the most worthless of all metals, its value being limited almost entirely to monetary and ornamental purposes. In 1492, the year America was discovered, the total stock of gold in Europe, in plate, jewelry and coin was estimated at about $600,000,000. Since the discovery of America, about 18 billions of the yellow metal have been added to the reserves of the leading nations of the world. Of this amount fully one half was plundered from the nations of the new world in the fifteenth and sixteenth century. Of the total amount, less than one half exists to-day. Every ounce of gold in the world has cost a human life. During the last ten years, the annual gold production of the United States has been reduced fully fifty per cent. What has an ounce of gold cost ? More than it is worth in dollars, besides untold cost in human blood and tears.

If Europe is steadily drained of its gold reserves, with no money acceptable to the United States except at ruinous rates of exchange to pay for the things bought from us, with no credit for the supplies and materials she needs, unable to pay what she owes, in many cases not even the interest due, how can America sell her surplus and Europe buy from America. America has too much gold and Europe has not enough. Yet America demands more and more gold in payment for her commodities, and Europe is unable to buy, with the consequence that we are passing through a business depression as acute as that which exists in Germany. America is suffering more than Europe is. The whole world is thereby financially disarranged.

If is is impossible to settle the debts of the world with gold, why should not money or credits be based on "capital goods," land, industries, mines, as well as gold reserves ? Why should not the bonds or guarantees of a nation be as good as the nation itself, that the "will to pay" as well as the ability to produce goods of value, be acceptable as gold in settling these debts ?

The United States has sixty per cent. of the gold reserves of the world but is suffering from an acute stagnation of business. If large gold reserves mean prosperity then not a man should be idle in the United States. Germany, with depleted gold reserves and billions of paper money has less idleness than the United States. If mere volume of money means prosperity, then Russia should be enjoying the "golden age." How can the nations of Europe reduce their paper issues without demoralizing their industries and how much gold would be required to stabilize Europe's paper issues, and, what is more important, where is all this gold to come from, when it is all flowing one way ?

There may be a solution to this world problem along lines that will maintain the gold standard, but we fail to see how it is to be brought about unless the United States is willing to accept cancellation of some of the war loans or some rearrangement that will shift the load from Britain and France on to her own shoulders. We are approaching the time when the ideas of Dr. Sun Yat-sen may have to be seriously considered as the only way to bring about world stability, in which commodities, merchandise, natural products, necessities of life, etc., will serve as a basis of values. For if Europe is to pay at all she must pay in trade. If this is so, America and the neutral nations of the world must suffer through business depressions.

* * *

International Good Manners

"IT is our duty to so direct the foreign relations of our country that the power of public opinion shall be for peace. More quarrels have come from insults than from injuries," declared Eliju Root in his San Francisco address. *The New York Times* editorially takes up the advice of this sane old American statesmen, and says that "behind and superior to formal diplomacy and official negotiation between governments, the condition precedent of a successful working of the best-devised machinery for composing international controversies and averting war is the will, the steady purpose, of each people to maintain peace, so far as possible. As Mr. Root said in his San Francisco address : 'It is our duty so to direct the foreign relations of our country that the power of public opinion shall be for peace.'

"The old dynastic, intriguing, conscienceless diplomacy is gone for the most part. The more "open" form that succeeds it may be made less powerful for good by the violence of public men and newspapers that roar and rage for their own purposes against some foreign nation or nations. So far as these continuous discharges of suspicion, hostility and falsehood have their effect, they beget or increase at home a misinformed and embittered feeling which is responded to abroad by a quickened and growing and dangerous resentment.

"In the close intercommunication and interpenetration of modern states, a wealth of disputes, misunderstandings, claims and counter-claims is inevitable. They can be settled amicably in the spirit of conciliation, compromise, friendly give-and-take. Representatives of the nation can get together "to talk things over," as Mr. Root says. "If there is a controversy, the most important thing is to get some one to change his mind." Meanwhile, all the purple-necked orators and organists of ill-will have been doing their best in both countries to create an inflamed state of the public mind. They are a minority, but in each country the influence of the rancorous faction in the other is apt to be overestimated.

" More quarrels," continues Mr. Root, " have come from insults than from injuries. If democracy is to conduct foreign affairs without taking the nation into strife, it must not give cause for resentment in the minds of other peoples." That is, democracy must improve its international manners. Ambassadors treat one another as gentlemen. The sovereigns they represent, the sovereign peoples, must do the same. Good temper, moderation, avoidance of heated and insulting language should prevail. The United States, in particular, should act in accordance with its power, dignity and responsibility.

" It should be understood," Mr. Root frankly declares, "that the American people will taboo loose and unfriendly talk about the people of other nations, and such punishment "—the withholding of votes from disturbers of peace—" will be the first step in our conduct of foreign affairs." The taboo can't be imposed too soon ; and it is refreshing to hear Mr. Root making this needed plain talk in the hunting grounds of Chief Hiram."

* * *

Political Agitation Affects Trade

THE aftermath of the Japanese boycott agitation in China and the campaign against the Anglo-Japanese alliance, in which British traders were also menaced by a boycott if the alliance was extended, is being revealed as the statements of conservative British business men are made public. The movement started in China was carried to India ; the club which whacked the Japanese was held over the British in the same identical manner, and with equal injury to legitimate trade. In destroying Japan's trade in China, British subjects who worked in close co-operation with other foreign leaders in inciting the Chinese to a boycott, failed to grasp the fact that two can always play at the same game. Japan paid the price of this campaign, and can now sympathize with the British.

The conditions in India arising from this boycott are summed up by Sir Montagu Cornish Turner, the chairman of the Chartered Bank of India, Australia and China in his speech at the last meeting of the shareholders held in London on April 5th. After setting forth the satisfactory balance sheet figures, which permitted the payments of a dividend of 14 per cent., together with a bonus of 6s. 3d. per share, making with the interim dividend, a total of 20½ per cent. per annum free of income tax, the chairman said :

"The year 1921 has been one of considerable anxiety, of hope deferred, of frequent disappointment, and of unavoidable losses to most of those trading with the East. In India the absorption of accumulated stocks, which might reasonably have been anticipated, has been hindered by two principal causes. Political agitation, with unfair pressure on innocent traders, has at many points been exercised to prevent consumption of British goods—an agitation which should never have been permitted to assume the proportion it attained."

In this conservative statement the chairman of the Chartered Bank corroborates other reports on the injury to British trade by the spread of methods that were so successfully applied in China to penalize the Japanese. Continuing, he said :

" As regards the position in India generally. I am disposed to take the view that, provided the government of India act consistently with firmness and justice—as I believe they will—there is no reason to view the situation with undue apprehension. In all parts of the world—East and West, even in England itself—we see a widespread spirit of restlessness and discontent. There is a craving for change, a desire to attain what is in many cases unattainable, and a tendency to oppose all existing forms of government. This is an aftermath of the great war, and only time, with universal peace and goodwill, can bring about the contentment and good fellowship which should prevail between nations and between the component parts of those nations. This is especially applicable to India, and I look forward with confidence to the time when we can say that the people of India are showing that spirit of loyalty, comradeship, and goodwill which should exist between all members of the British empire. But to effect this we must have consistency in policy and firmness in administration. I do not deny that there are troubles at some points—serious troubles—in India, but they are partly agrarian, and can be dealt with by a just and firm government. The conclusion of a peace with Turkey on liberal lines, as recently outlined by Lord Curzon, will also help to alleviate the present strain."

In regard to trade conditions in China, Sir Montagu added :

" In China the offtake of imported goods has also been interfered with by extremely unsettled conditions in the interior of the country, and by the comparatively low rate of exchange. Serious losses have resulted, but the position has improved of late, and stocks are moving off gradually. Some time must elapse, however, before the position of the import markets either in India or China can be regarded with equanimity. Summarising the position of the Eastern markets generally, we may say that, while export markets mainly show very little life, import markets have improved to the extent that accumulated stocks are being gradually worked off, but it would be absolute folly on the part of shippers on this side to pour in fresh supplies which are not needed. The motto for all of us should be 'slow and sure' until the dark clouds of depression have disappeared, and the purchasing power of consumers has attained more nearly to normal levels."

* * *

Root on China

(From the presidential address by Elihu Root before the sixteenth annual meeting of the American Society of International Law, Washington, D. C., April 27, 1922.)

"THE four-power treaty was not enough, however, standing by itself, to make the new condition stable without some treatment of the causes of irritation which had arisen and which might be apprehended upon the continent of Asia. For the discussion of this subject four other powers having interests in the Far East, Belgium, China, the Netherlands and Portugal, also took part . . .

" Under the conventional arrangements with China there had developed a vast extent of beneficial trade and industry upon which multitudes of people in and out of China were dependent. It was evident that to attempt then to wipe out all the arrangements which I have described and put China immediately upon the footing of a full member of the society of nations unhampered in her trade, her administration, and her maintenance of order, except by the rules of international law, would be futile and disastrous, for there was no government in China competent to maintain trade, to administer justice to foreigners, or to protect foreign life and property. It was evident, too, that China must work out her own salvation, that no exercise of foreign power could accomplish the result. Four hundred and thirty million people are too great a mass to be reformed from the outside. If China is to possess her own territory with independence and control of her own destinies, she must learn to govern herself and to assert and maintain her own rights as a nation.

" Accordingly, the members of the conference addressed themselves to the task of helping China so far as it was possible in her struggle to achieve self-government . . .

Any one examining the treaties and resolutions will find that they uniformly sought a double object, first, to relieve the limitations and inconveniences flowing from the old conventional relations as far as was then practicable under the existing governmental conditions in China, and, second, to afford to all sections and parties of the Chinese people a helpful incentive to unite in the establishment of an effective and stable government by making specific provisions under which such a government, competent to perform its national duties, will be the means of bringing China into the full possession of the rights and liberties assured by international law to the members of the family of nations, just as Japan has been brought into that family.

" Personally I am a believer in the coming of that event. It will be a long, difficult process, for it requires the new education of more than four hundred million people, but I look to the future of that industrious, kindly, peaceful people, with their inveterate respect for individual and family rights, not as a yellow peril but as a great reinforcement, to the power of ordered liberty upon the domination of which the future of our civilization depends."

* * *

Don't Overlook Publicity!

THE Pennsylvania bankers' association is alive to the fact that foreign trade constitutes a most important factor in the permanent prosperity of the nation ; that all must co-operate in the effort to develop it along safe, permanent and profitable lines. Such co-operation demands accurate information and quick

service, and should be carried out with the idea of promoting friendly international relations along lines that make for peace. A foreign trade policy based upon sentimental regard for one nation while antagonizing another rich and profitable customer, can bring no lasting or beneficial results.

The Pennsylvania bankers' association were quick to sense the meaning of the Washington conference and the opportunities now before the nation to extend its foreign trade, and to this end organized a committee headed by Dr. J. T. Holdsworth, vice-president of the Bank of Pittsburg, who, by reason of his intimate grasp on foreign exchange problems, is recognized as one of the foremost experts in this field. In a very concise statement, Dr. Holdsworth spoke more truths than we have seen in the many recent papers which purport to emanate from foreign trade authorities, and concludes by saying that what Americans need is a fresh baptism of grit, initiative, perseverance and courage, and be ready to co-operate heartily in the development of their export and import business. And we will add something that Dr. Holdsworth overlooked, and that is, to be successful the American business man, banker, trader and manufacturer must make up his mind that one of the essential cogs in the wheels of trade is publicity, without which, he will get nowhere in the struggle for markets. Unless the American manufacturer supports an American publication that is carrying his load in foreign fields, he cannot hope to have his interests at all times defended as they should be. Without this whole-hearted support, an American publication cannot exist. Publicity, and the defense of national policies in foreign fields, is as much as part of the machinery of successful trade as the bank, broker, commission house or transportation line. Without that publicity and the sympathetic co-operation of newspapers designed to assist national trade, it is a very easy thing to lose the hold on a foreign market.

* * *

None of Our Business

THE following editorial from the "Official Organ of the American Chamber of Commerce for Brazil" is worth reproducing, for the benefit of foreigners in China. The Chinese must work out their own destiny in their own way. It should not concern any foreigner how she does this, or what party, leader, or policy wins in the present difficult period of unification. When the United States was engaged in settling its internal problems during the civil war, several European powers whose trade was disarranged attempted at various times to bring about conciliation. This finally led to a notification from President Lincoln to the powers concerned, that any overtures having for their object peace between the north and south, would be considered as an unfriendly act. China is entitled to the same consideration in settling her affairs in her own way. It is emphatically none of our business :—

"The political campaign, which is absorbing the attention of our Brazilian friends at present, comes closer to being none of our business than anything of which we can think, off hand.

"There are many lines of activity in this country which may be considered of legitimate interest to resident foreigners, but the election of the president of the republic is not included.

"The more or less painful labors, through which not only Brazil but every republic passes in the production of a new administration constitute a phenomenon which should be in no way unfamiliar to Americans. No one should be able to realize more acutely than an American that political campaigns generate heat and super-sensitive nerves. No one should be better able than an American to understand the resentment that is invariably aroused by 'the foreign vote.'

"A considerable number of Americans, as well as other foreigners, who have been decorated with wooden crosses in Mexico and Central America, would probably have been alive and prosperous to-day if they had not butted into local politics. The fact that they are now 'At Rest' indicates former ill-placed activity.

"One evil result of the assumption of a partisan attitude by any one American is that it may become noised about that such is the position of 'the Americans.' The acts of one fool foreigner may be sufficient in these times of stressed sensibilities to place a highly undesirable odium on his fellow countrymen.

"The facts and conditions which have raised the present political issues are but partially understood by foreigners, but one fact which is fairly obvious to even the most casual observer is that the Brazilians are capable of handling their own affairs fully as well as most peoples.

"Between now and next March, while the Brazilians are whooping it up for their candidates, there is an excellent opportunity for resident foreigners to confine their attention to their own business—if they have any."

* * *

Peking and the Consortium

MR. Hall's excellent article on the financial program of the new Peking cabinet would indicate that the day is drawing nearer when the consortium deadlock must be broken and negotiations initiated to relieve China's distressing financial situation. However, some time will elapse before the dreams of Peking can be realized. The first requisite to a foreign loan is unification, followed by recognition of the consortium by the Chinese government. As matters stand, the joint note from the British, American, French and Japanese legations at Peking to the Chinese foreign office transmitting the consortium dossier (dated September 28, 1920) remains unacknowledged. The first move after unification, is therefore an official acknowledgement of the friendly note of the powers, which explains in full the surface reasons for the creation of the consortium. Then, once a basis for official negotiations is established, all communications, conversations and conferences must be conducted openly and above board by the duly authorized minister of finance or his delegates. The day is passed when such negotiations can be carried on in secret by intermediaries. When these preliminaries are carried out, there is little doubt that the consortium will be ready to do business along lines that will safeguard not only the interests of China but those of the bondholders

Any premature attempt to negotiate a re-organization or funding loan before China is reunited would be fatal. As a matter of fact, such a loan could not be issued in the United States with any chance of success. It is only necessary to point out that the Canton government maintains a very intelligent and highly efficient publicity organization in Washington and that nine-tenths of all Chinese resident in America are active sympathizers with and contribute funds to the cause of Sun Yat-sen. The parades of protest and general hullabaloo on their part, coupled with a vigorous publicity campaign last year against the then suggested loan to Peking, warns us that such activities would be redoubled. Americans would be told that they were sacrificing republicanism or democracy to a military autocracy, and there is little doubt as to the effect of such arguments upon a people who view these problems largely from a sentimental angle. A loan to Peking, if made at all, would have to be carried by the bankers, with the prospect of it being repudiated at some time in the future. Obviously, American bankers would hardly care to assume responsibility of carrying the load of a long-term Chinese issue under such conditions, even if we admit that the state department would sanction it.

There is no more reason to believe that any of the other groups would interest themselves in a loan to the Wu Pei-fu cabinet unless the south is brought into line through reasonable compromise. Notwithstanding the inclusion of the Nishihara loans in the proposed refunding plan, which, we are told, is due to the desire of Wu Pei-fu to release China from any obligation to Japan, it is extremely doubtful if this would induce the Japanese government or its group to forego their fixed policy to refrain from financial intervention in China until unification is accomplished. Japan will take no more chances in financing any faction in temporary control of Peking, and if the readiness of Wu Pei-fu to recognize loans which his party have repudiated to date, is intended to influence

Japan into approving a loan pending unification, he will probably be disillusioned. Japan has greater interests at stake in the pacification and unification of the country than in the repayment of a loan of $180,000,000.

We have been informed that the British group has sent out encouraging feelers to the new government and that if a loan is made to the Wu Pei-fu cabinet it must be on their initiative. Obviously, the wish here is father to the thought. Conditions have changed since 1913, and it would be now impossible with America in the consortium to repeat the mistake of the reorganization loan which cemented Yuan Shih-kai's power as a military dictator and made possible the creation of the Peiyang military oligarchy. The Kuomintang cannot be eliminated and brushed aside as it was in 1913, without creating a split that would endanger the existence of the consortium and undo all the good work that has been accomplished to bring about international co-operation in the solution of China's difficulties. Public opinion in the United States, in Japan, in Great Britain itself, would not countenance another such unwarranted interference in the internal affairs of China. The South, and what it stands for, is a vital element in the present struggle and those who advocate a loan to the Wu Pei-fu cabinet should remember that this is China's problem, in which no other nation has the right to interfere. If unification again brings the Kuomintang into a position of power, and it fails to live up to the required standards, it is China's funeral. A loan that ignores this elementary factor in China would only tend to defeat its purpose and invite a continuance of the differences which have prevented a return to normal conditions in this country. For these reasons we believe that the stories circulated about the encouraging attitude of the British group towards financing Wu Pei-fu's funding loan are without foundation in fact, part of a propaganda to create a sentiment favorable to such a procedure.

China is making progress. There is no doubt of that. If left to themselves, the Chinese will find some solution to their difficulties acceptable to their own conception of what is right and proper.

* * *

Japanese Railways 1921

FROM the point of income alone the business of the Imperial Government Railways has been steadily increasing since the beginning of the great war. The reasons for this increase are, however, largely to be found in the increased mileage of tracks and the greatly increased charges for freight and passenger services. Thus while on the surface the results of operation were exceptionally good, an examination of the actual business fails to sustain the actuality of the improvement during the years of Japan's war prosperity.

For instance, in 1914, the average number of miles of track in operation was 5,538 ; in 1921 this had increased to a little more than 6,600 miles, by slightly more than 20 per cent. But passenger fares were raised on July 16, 1918 by 50 per cent., and again in February 1920 by 50 per cent. of the fares charged in 1918. Freight rates were raised by 20 per cent. on September 15, 1918, and on January 10, 1921, the classification of freight was revised in such a manner as to raise the average rate by 28 per cent. Compared to before the war freight rates, this was an increase of 53.6 per cent. Considering the natural effects of these increased rates on aggregate income as well as the increased business brought about by the extension of operated lines, the rise in income since the beginning of the war is not particularly extraordinary.

Passengers Carried Increasing Annually.—Statistics of passenger business show that the number of passengers carried on the Imperial Government Railways has been increasing every year between 1914 and 1921, and a comparison of the traffic in the two years shows the passenger traffic of 1921 to be 2½ times greater than that of 1914.

TABLE I.

Passengers carried and Passenger Income 1914-1921.

	No. of Passengers	Increase compared to previous year. Per cent.	Income Yen	Increase compared to previous year. Per cent.
1914 ...	166,090,000	—	44,670,000	—
1915 ...	172,290,000	3.7	57,280,000	4.7
1916 ...	197,040,000	14.3	64,770,000	13.1
1917 ...	245,240,000	24.4	84,730,000	30.8
1918 ...	269,590,000	9.9	120,750,000	42.5
1919 ...	331,120,000	22.8	162,820,000	30.0
1920 ...	378,550,000	14.3	204,710,000	25.7
1921 ...	418,000,000	10.4	211,540,000	3.3

In this manner traffic has increased, but the passenger fares have also increased. Since 1919 both the rate of increase in passengers carried and in income has been steadily falling, indicating that the number of passengers traveling short distances has increased while the long distance travel has fallen off materially.

Freight Business

Along with a steady increase in the tonnage carried income from freight traffic has shown a steady advance for several years past, but the class of freight carried has recently shown a great change.

In 1915 there was a material falling off in freight carried. In 1914 the Imperial Government Railways handled 35,700,000 tons, but in 1915 the total freight carried was only 34,160,000 tons, a decrease of 43 per cent. In 1916 the business of the country began to feel the effects of the growing war prosperity and there was a considerable increase in the tonnage offering. For the first three months of 1916 the average tonnage carried was 3,000,000 tons a month ; for the last three months, 3,750,000 tons a month. The year's total tonnage was 40,000,000 tons ; monthly average, 3,270,000 tons. Compared to 1914 this was a 12 per cent. increase.

With the continuing growth of war prosperity the tonnage carried rose year after year until during one month in 1919 the total carried reached 5,000,000 tons.

In the second half of 1920 the effects of the great panic caused a sudden falling off in tonnage. Until May, 1920, the tendency was towards increased freight business, tonnage that month reaching the highest amount ever known on the Japanese railways, 5,140,000 tons. Thereafter there was a most decided falling off. From 1915 on there had been an annual increase of 14 to 15 per cent., but when compared to 1919 tonnage in 1920 showed a falling off about 5 per cent.

The total tonnage moved in 1920 was 53,750,000 tons. This fell in 1921 to 52,100,000 tons, a decrease of 4,000,000 tons compared to 1918, about 7 per cent.

Freight Moved on Imperial Government Railways 1913-1921.

	Tons
1913	35,079,000
1914	35,704,000
1915	34,168,000
1916	39,294,000
1917	45,549,000
1918	50,730,000
1919	56,206,000
1920	53,751,000
1921	52,105,000

Freight According to Classification.—The greatest decline in tonnage has been in the amount of coal moved. The decrease in the total tonnage moved in 1921 compared to 1920 is 3 per cent. But the decline in coal tonnage moved was more than 11 per cent., so that the real reason for the falling off of total tonnage in 1921 is to be found in the decline of the coal trade. Coal was 34 per cent. of all cargo carried in 1919 and 1920, but in 1921 it was only 31 per cent. of all cargo, a decline of 3 per cent., the actual percentage of the falling off of all tonnage.

Because of the extremely bad condition of all manufacturing industries, the nation's coal consumers, no early revival of the coal trade, and consequently of the coal carrying trade, can be expected.

After coal, in 1921, the greatest falling off of tonnage is seen in ore, iron and steel, salt, stone, building materials, cement and raw cotton. These commodities have made the greatest tonnage decreases, but compared to the falling off of coal tonnage, their declines are all small. In 1921, however, certain commodities showed noticeable increases in tonnage; rice, limber, fertilizers, charcoal, fresh fish, paper, Japanese and foreign; cotton cloth and yarn, sugar, kerosene, and *saké*, when compared to their tonnages moved in 1920.

Most Important Commodities carried on Japanese Railways:

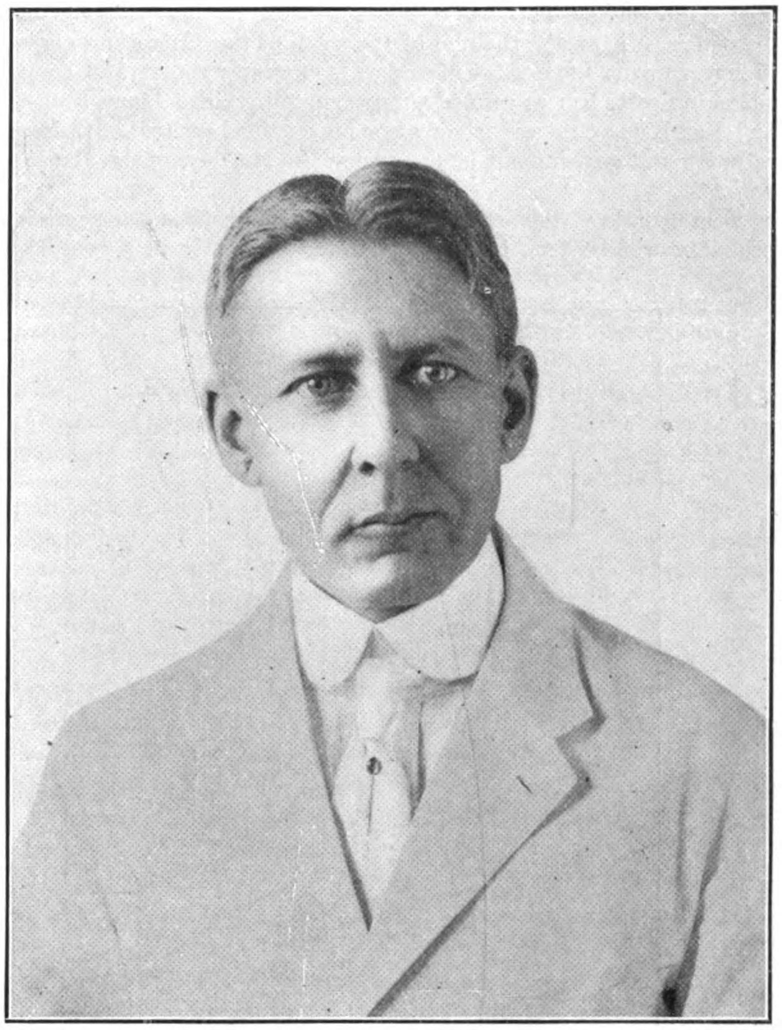
	1921 Tons	1920 Tons	Increase or decrease Tons	Rate Per cent.
Rice	2,392,000	1,957,000	435,000	22
Lumber	5,158,000	4,984,000	174,000	3
Ores	680,000	767,000	87,000*	11
Coal	16,868,000	18,326,000	1,958,000	11
Iron and steel	614,000	633,000	19,000*	3
Fertilizers	2,260,000	2,016,000	245,000	12
Charcoal	1,281,000	1,094,000	187,000	17
Food salt	455,000	461,000	6,000	1
Fresh fish	458,000	326,000	132,000	40
Paper(foreign & Japanese)	355,000	205,000	149,000	73
Dried fish	307,000	221,000	85,000	39
Cotton yarn and cloth ...	654,000	375,000	279,000	74
Wheat	550,000	472,000	79,000	17
Fresh fruit	319,000	289,000	30,000	10
Fuel wood	571,000	513,000	57,000	11
Stone building material	704,000	705,000	1,000*	—
Sand and pebbles ...	2,590,000	1,588,000	1,001,000	63
Petroleum, etc.	516,000	470,000	43,000	9
Sugar	373,000	280,000	93,000	33
Alcoholic beverages ...	626,000	415,000	210,000	51
Cement	553,000	559,000	6,000*	1
Raw cotton	241,000	248,000	7,000*	3
Grains	314,000	305,000	8,000	3
Others and total... ...	52,175,000	53,662,000	1,487,000*	3
Income	Y.161,571,000	Y.126,932,000	Y.34,639,000	26%

*Decrease.

A Scientific Products Laboratory for China

IT is universally conceded that the greatest achievement of American rule in the Philippines was the establishment of the bureau of science with its wonderful record of efficiency in investigating tropical diseases and discovering and applying new remedies and serums which kept down the death rate of the people and prevented plagues which yearly decimated the domestic animals. From the start, this bureau held the attention of and won the highest praise from the world of science for the thoroughness of its studies, conclusions and reports. The latter stand as the most valuable collection of records of research into tropical science that exists to-day, a permanent testimonial to the painstaking care of those who conducted the investigations and drew up the reports. Manila, the islands and the Far East in general, are heathier places to live in as a result of the labors of this group of American scientists, under the capable direction, first of Dr. Paul C. Freer, and later on of Dr. Alvin Cox. The bureau of science with its wonderfully equipped laboratories was the foundation upon which the health service of the islands was erected, the pride of the American administration, the sign of our progress and civilization. One of the results of the Harrison administration was to create conditions that caused the retirement of Dr. Cox and make the bureau more and more dependent on Filipinos, with the same results that characterized their administration of other important bureaus. The loss to the Filipinos may have resulted in a gain to China. It brought Dr. Cox to this country with the idea of investigating the possibility of establishing a commercial laboratory in Shanghai that would do for the Chinese what the bureau of science in Manila did for the Philippines.

Without minimizing the good work along these lines accomplished by others, or detracting in any way from the merits of foreign manufactured products which find a large and increasing sale in this market, it is fair to state that the necessity of such laboratories is a crying need in China. It is a virgin field, vast in its possibilities for scientific research. Strange and rare diseases unknown to Western medical science call loudly for special scientific investigation and the discovery of remedies and serums to combat their ravages.



Dr. Alvin J. Cox,

Formerly Director of the Bureau of Science in Manila

There is not only great need of, but an excellent commercial opportunity for, an institution that will specialize in the common products which hold a real and permanent place in the materia medica, such as vaccine virus, antidysenteric, antitetanic, antidiphtheritic and normal horse serums, and antirabic, gonococcus and autogenous vaccines, etc. Such an institution will be a great boon to China.

In normal times, the government of China would no doubt co-operate in facilitating the manufacture of biologic products and other similar enterprises which have a distinctly governmental significance. It should be an easy matter to prove to the government the value of establishing vaccination headquarters in each province, and reduce the ravages of smallpox in China to almost nil. Vaccine virus for the vaccination of 400,000,000 people would be a large order, taxing the capacity of all the laboratories in the world to fill. Yet some day China must come to it, the same as all other nations, and the vaccine will be supplied from laboratories established in China, if the order is to be filled.

WU PEI-FU'S FINANCIAL PROGRAM

By Josef W. Hall

IT has been years since China has undergone a political overturn of so sweeping a nature. More important than the eradication of the dominance of Chang Tso-lin from Chinese national affairs is its by-product: the turning out of the old mandarinate from Peking, which has culminated in the retirement of President Hsu Shih-chang. This has a direct bearing on financial matters inasmuch as it means the end of the reign of the Chiaotung clique in government finance. This reign, sometimes direct and sometimes indirect, has continued uninterruptedly since Liang Shih-yi and Yeh Kung-cho and their associates gained control of Chinese railways and government banks during the last days of the Manchu *regimé*.

Immediate visible evidence of the fall of the Chiaotung princes probably will be seen in two eventualities: firstly in a complete new policy of government railway administration; and secondly in the separation of the Bank of China or Bank of Communications from the government, or the amalgamation of the two banks—leaving but one national official banking institution. The minister of communications, Mr. Kao En-hung, has been set the difficult task of eliminating Chiaotung and other political influences from his ministry and placing government communications upon a purely business basis of administration. His first act has been the lopping off of some three million dollars silver per year from the payroll which involves the abolition of all superfluous positions, whether advisory or managerial. The directorates general of five railways have been abolished.

General Wang Shih-chen (the Dragon), new Premier of the Peking Government

Tung Kang, Peking's new Minister of Finance

Mr. Kao is living up to the letter of contracts with foreign financiers providing for these positions, by conferring upon the managing directors the concurrent title of director general. Mr. Kao's policy towards the railways, while not expressedly that of unification, is one of economy through amalgamation of various departments concomitant to traffic such as the police and sanitary services.

In the ministry of finance a more complicated situation is faced. There the new minister, Tung Kang, must reckon with the open hostility of the Chinese Chiaotung bankers whom he has injured and implicated in his recent graft investigations, the apathy of the foreign loan market due to defaults on foreign obligations, the decrease in customs revenue caused by adverse exchange, and the crushing burden of usury which the government is obliged to pay to its miscellaneous creditors.

One of the first schemes which the new ministers who are carrying through General Wu Pei-fu's policies plan to execute, is a gigantic refunding loan for the purpose of regularizing all obligations and reducing the usury to a normal interest. It is hoped through this means to effect a saving of twenty million dollars per year in interest on four hundred million dollars of unfunded loans. The success of this scheme is, of course, dependent upon the status of Chinese credit, both domestic and foreign, but particularly foreign.

The plan of the new Chinese cabinet is to fund four hundred million dollars silver worth of public loans, comprising practically all of the national indebtedness not under process of repayment from dependable revenues like the customs. The fund is proportioned about as follows: domestic issues, two hundred and forty million; American and European loans, eighty million; unsecured Japanese obligations, one hundred and eighty million.

These last, it will be readily recognized, are the Nishihara loans. The determination of the new *regimé*, which is generally regarded as anti-Japanese, to manfully meet these obligations which previous *regimés*, freely designated as pro-Japanese, have declined to so much as recognize, should create a sensation as well as cause

a great revulsion of feeling throughout Japanese business circles. How hard Japanese bankers have been hit by their inability to collect principal and interest on this money lent by them under the influence of their government for purely political reasons and spent or frittered away by corrupt Chinese officials, is a story the half of which has never been told. Nothing which could be done would contribute so much toward rallying the good will of the substantial element in Japan to the new *regimé* in China as the execution of this policy, which is the outgrowth of General Wu Pei-fu's desire to place all relations with Japan upon a clear and definite basis.

There is another phase to the refunding scheme which greatly concerns the international prestige of China. As is generally known, the Washington conference provided for the assemblage in China in January of next year of an international commission for the discussion and determination of the conditions which are to apply to the two and one-half per cent. increase in the customs tariff. Although nothing has been put into black and white to this effect, it is understood by both Chinese and foreign interests involved that the increased revenue is to be pledged to the amortization of various defaulted and uncovered foreign obligations before any part of it passes into Chinese hands. This, of course, virtually means that the foreign powers are to pay China's debts for her. It is, however, greatly saving of Chinese prestige as well as much more agreeable all around to have the Chinese themselves propose such a solution. The obligations to be embodied in the four hundred million dollar refunding loan, with the exception of the Nishihara loans and the Marconi issue, are already covered by good security and provided with revenues for their liquidation, but any deficiency in securities or revenues, according to the plans of the framers of the scheme, is to be met by the expected increase in the customs tariffs.

Many details of the scheme remain to be considered, although some of the most obvious difficulties have already received full discussion. In harmony with the policy of the new finance minister the public will be kept in knowledge of all decisions. Mr. Tung Kang states that several months will be required to develop this scheme. "I am not in favor of loans," said Mr. Tung Kang, "and I believe that a great majority of them in the past have been made for the benefit of the borrowing officials rather than to meet the exigency of the country. However, what we now propose is not a loan to be spent upon unproductive expenses or even upon construction projects but rather a funding of the present obligations against the government, both foreign and domestic, which have been contracted in such an irresponsible manner as to gravely impair the standing of the nation. And we hope, as well, to effect a great saving in interest. The first problem is to eradicate corrupt influences in the ministry of finance and its many subsidiary bureaus, and fill the financial and tax collection posts in Peking and throughout the provinces with men of integrity. This is no quick and easy task. Having attained something toward its accomplishment we will then be in a position to go ahead with our scheme."

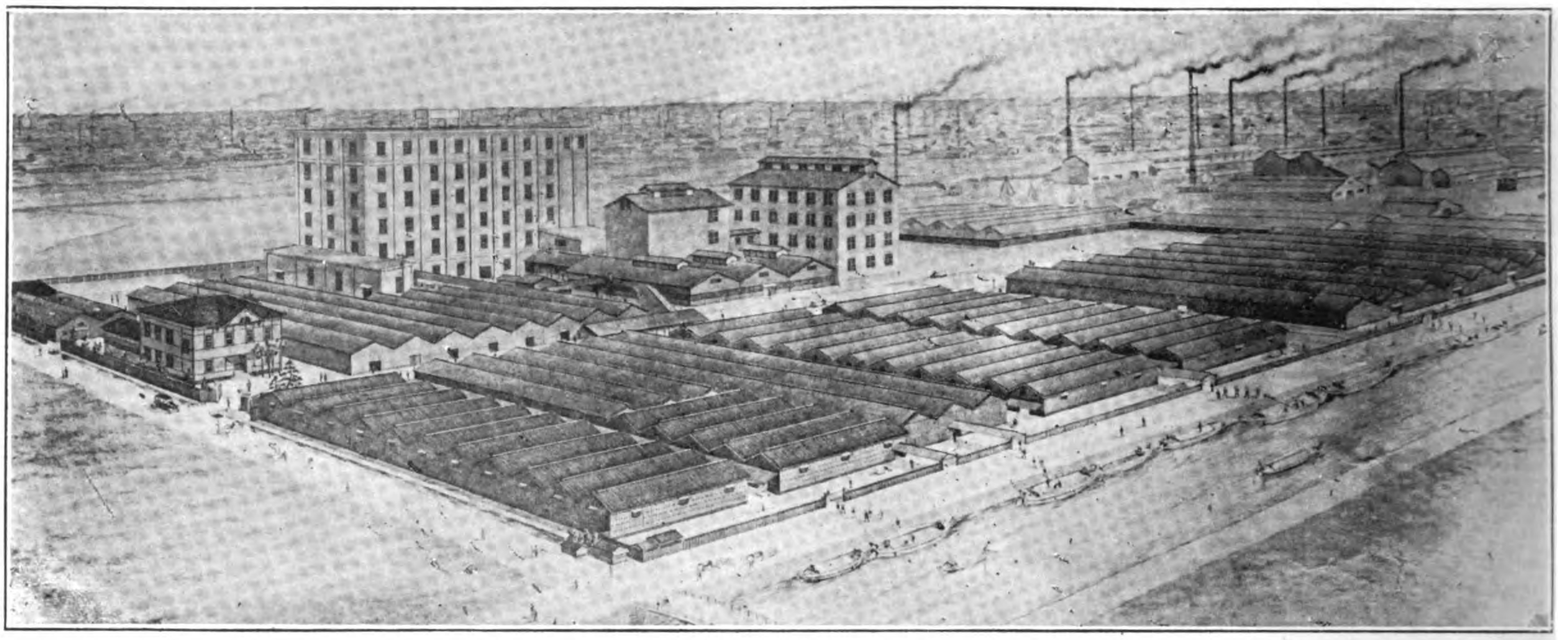
It is not planned to borrow to meet current administrative expenses. It is hoped by Messrs. Tung Kang and Kao En-hung that the savings effected by the abolition of superfluous posts and the introduction of measures of efficiency will enable the government to pay its way as it goes. As a means of working toward this end the ministries and departments of government and the railways are being put back, as far as is practicable, upon the budgets of the first year of the republic. An idea of the savings which it is hoped to effect through this change was given by Mr. Kao En-hung who spoke of two railways as examples. The operating expense budget for the first year of the Kin-Han Railway was thirty-four million dollars. This year it is forty-seven million, an increase of thirteen million, or more than forty per cent. The Peking-Mukden Railway's budget of operating expenses has increased within the same period of time by eighteen million dollars per annum. Mr. Kao hopes to effect a saving of at least thirty million dollars per annum on railway expenses. This, considering the pruning which he is making in budgets, seems to be a modest and safe estimate. At the same time he plans to save ten million dollars per year on the administrative expense of the ministry—a rather more difficult problem. If the railways can be brought back to the earning capacity of two years ago and the new audit system introduced by Mr. Kao proves an effective safeguard for the surplus profits, the government should be better off from this source by some twenty to forty million dollars yearly, which have heretofore gone into the pockets of the Chaotung clique.

The loan refunding scheme takes care of all government obligations, with the exception of payments due British, Japanese and American firms for materials supplied for the government railways. Those are said to total something like twenty-five million dollars. They are, however, secured upon the materials themselves and the railway revenues are pledged for their liquidation. The moment that efficient railway management and the return of peaceful conditions provide earnings surpassing operating expenses, these obligations will care of themselves.

The only remaining financial problem of any magnitude is that of the support of the troops. It would appear that henceforth the only military forces which are to receive recognition and support from the Peking government are to be the armies of General Wu Pei-fu. The cabinet in its last meeting pledged General Wu one million dollars per month for the upkeep of his forces in return for which Wu is to release his hold upon the Hupeh salt revenues and the revenues of the Peking-Hankow Railway, allowing these to revert as originally to the central government. The minister of finance has in turn requested General Wu to enforce payment of the proper provincial contributions to the central government's upkeep. The general has replied that he is prepared at any time to obey a reasonable mandate of the government in event of the recalcitrance of provincial officials.

General Wu Pei-fu

The Military leader of the Chihli or Peiyang Party, who faces the grand opportunity to unite China, and restore her prestige amongst the nations.



The Plant of the Toa Flour Milling Company at Tokyo

Japanese Flour Mills

By *H. C. Hugins*

THE Japanese flour milling industry made its first great step forward after the Russo-Japanese war. Its next period of development began with the outbreak of the great war. Before the Russo-Japanese war the whole production of all Japan's mills was only 750 barrels in a day of 24 hours. After the war this had increased to 8,710 barrels in 1911, and gradually continued to increase until just before the great war, in 1914, the productive capacity of all the flouring mills in Japan was 9,060 barrels. To-day, in 1922, this has risen to 21,000 barrels, a day of 24 working hours.

According to statistics published by the department of agriculture and commerce, in 1905, the total productive capacity of all the mills was 1,300 barrels, every 24 working hours. In the Kwanto district (Eastern Japan), there were then only nine companies operating 14 mills producing a total of 1,100 barrels a day. In the Kwansai district (Western Japan, with Osaka as a centre), there were seven companies operating seven mills producing only 200 barrels. The oldest of all these mills is the Ogibashi Flour Mill belonging to the Nihon Seifun Kabushiki Kaisha (Japan Flour Milling Co., Ltd.), opened in September, 1897, with a capacity of 200 barrels. Practically all the other companies operating before the Russo-Japanese war were established in 1901. Just after the outbreak of that war there were four companies in Ogata, Sapporo, Nagoya and Osaka, established in 1905, and together with the production of the old concerns the total production of the whole country then reached 5,200 bags a day, 130,000 bags a month of 25 days, and 1,560,000 bags a year.

All the factories mentioned were operated by power other than primitive water wheels, and their gradual development slowly effected a reduction in the output from the primitive mills scattered all over the country in every wheat producing centre. At that time these primitive mills were very active supplying war demand, and they produced from 8,000,000 to 9,000,000 bags a year.

Flour was first produced by the primitive water wheel mills, then large quantities were imported to fill up the nation's needs, particularly from the United States. In 1905, more than 4,990,000 bags were imported, and when modern mills were first built they produced not more than 10 per cent. of all the flour used in Japan.

The number of mills and their capacity, in 1905, and in 1911, is compared in the following table :—

Name of Company owning Mill and Mill's Name.	1905 Capacity in 24 Working Hours	1911 Capacity in 24 Working Hours	Location of Mill.
Kwanto District :—			
Nihon Seifun K.K. :			
Principal Mill...	400 Bbls.	400 Bbls.	Tokyo
Onagigawa	— ,,	800 ,,	,,
Sunamura	— ,,	600 ,,	,,
Nisshin Seifun K.K. :			
Tatebayashi	100 ,,	1,000 ,,	Tochigi
Utsunomiya	100 ,,	400 ,,	,,
Yokohama	— ,,	400 ,,	Kanagawa
Toa Seifun K.K. :			
Principal Mill...	— ,,	700 ,,	Tokyo
Sapporo	200 ,,	200 ,,	Hokkaido
Shiraishi Kofun K.K.	65 ,,	65 ,,	Fukushima
Uzen Seifun K.K.	50 ,,	60 ,,	Yamagata
Matsumoto Seifun K.K. ...	65 ,,	65 ,,	Saitama
Matsudo Seifun K.K.	40 ,,	40 ,,	Chiba
Ogata Seifun K.K.	30 ,,	40 ,,	Kanagawa
Kanagawa Mogi Kojo	50 ,,	— ,,	,,
Total ...	1,100 Bbls.	4,760 Bbls.	
Kansai District :—			
Masuda Seifun K.K.	— Bbls.	1,000 Bbls.	Hyogo
Nihon Seifun, Hyogo Mill ...	— ,,	700 ,,	,,
Asahi Seifun K.K.	— ,,	200 ,,	,,
Nihon Seimai Seifun K.K. ...	— ,,	250 ,,	Kobe
Nagoya Seifun K.K.	100 ,,	100 ,,	Nagoya
Osaka Masuda Seifun K.K. ...	100 ,,	100 ,,	Osaka
Dairi Seifun	— ,,	1,600 ,,	Moji.
Total ...	200 Bbls.	3,950 Bbls.	
Grand Total ...	1,300 Bbls.	8,710 Bbls.	

The capacity of the power mills developed rapidly until 1911 when it reached 8,710 barrels. The Nihon Seifun K.K.'s mill at Onagigawa was opened in April, 1908, at Sunamura in October, 1907, and at Hyogo in July, 1907. The Yokohama mill of the Nisshin Seifun was opened in August, 1909, and the Toa Seifun's mill at Tokyo was in operation in January, 1908. The Masuda mills and the Nihon Seimai Seifun mill were opened shortly after the Russo-Japanese war began.

In 1911 production of flour had reached 34,840 bags a day of 24 working hours. Annual production was 10,452,000 bags. One of the results of this great increase in power mill production was to drive the small water-driven flour mills out of business, and in this same year their total production fell below 7,500,000 bags. Imports also declined to only 798,000 bags. Power mill production and the old water wheel mill production were about the same, but import fell to only one tenth of the power mill production, one twentieth of the total production of flour in all Japan. The reason for this great change in the position of imports between 1905, when about 4½ million bags were imported, and 1911 when only about 800,000 bags were purchased abroad, is to be found in the revision of the tariff charges on flour which, at first taxed only 70.3 sen per 100 *kin* (133-lb.), was after the revision taxed Y.1.50 per 100 *kin*, an advance of more than 100 per cent. Wheat was not so adversely affected. Taxed at first only 50.3 sen per 100 *kin*, after the tariff revision it still was very lightly taxed at 57 sen per 100 *kin*. Naturally this stimulated the production of flour at home, and raw material took the place of manufactured flour in the country's imports.

From 1907-1908 on so many factories were built that production eventually passed the point where the Japanese nation could absorb it. Naturally prices fell, and the trade was badly hit. Matters dragged on in a very indeterminate state until 1911 when the Nihon Seifun K.K., Nisshin Seifun K.K. and the Toa Seifun K.K., entered into an agreement to limit production from December, 1911 to May, 1912, to one-half of their potential capacity, and to fix prices at which they would sell their competing brands.

Just after the Russo-Japanese war, because of the competition off the domestic brands, imported flour fell into a very bad way indeed. And from that time on until the outbreak of the European war, there was practically no increase in demand for Japanese flour, either at home or abroad.

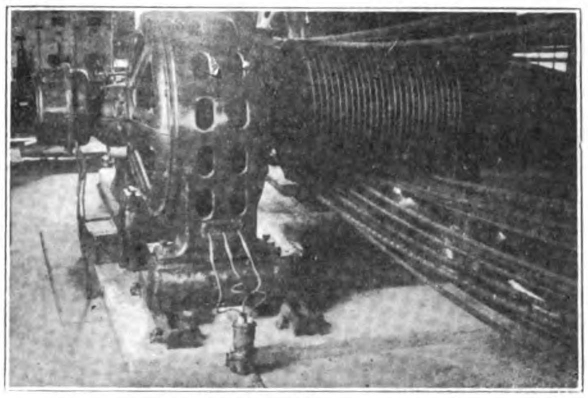
In 1914, the productive capacity of the machine power mills in the Kwanto was 5,080 barrels a day, in the Kwansai it was 2,250 barrels a day, in Kyushu, 1,600 barrels a day and in Nagoya 130 barrels a day, a total daily productive capacity of 9,060 barrels every 24 hours. This was an increase of only 350 barrels a day since 1911.

To-day, in 1922, many of the old companies have increased their equipment and raised their capacity. Many new companies, too, have added their production to the nation's flour supply. In the Kwanto 12,540 barrels, in Nagoya 1,830 barrels, in the Kwansai 4,800 barrels, in Kyushu, 2,450 barrels, a total of 21,620 barrels, can be milled every 24 hours. This is an increase of 220 per cent. compared with 1914. Production in one day is 97,290 bags, or 29,187,000 bags a year. If the actual potential capacity of each factory were only 80 per cent. of this quantity it would still be 23,350,000 bags a year. However, under any circumstances, at the present time, the production of the Japanese flour mills is in excess of the needs of the country. Productive capacity of Japanese flour mills, 1914 and 1922.

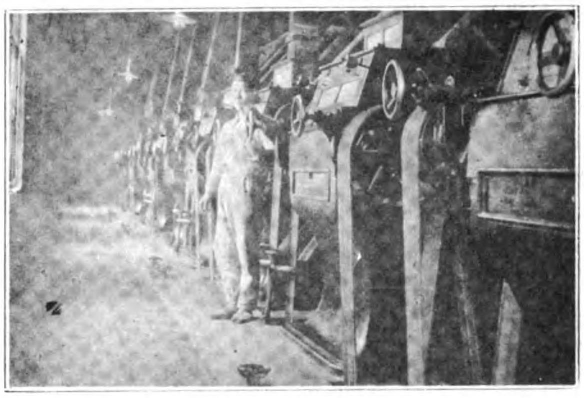
The domestic demand to-day requires only 13,500 barrels a day. Consequently there is always an excess of production. Since the great war export has almost ceased, and rate of domestic consumption despite great efforts made to persuade the Japanese people to eat bread in place of rice, is not increasing at any perceptible rate.

For a time raw material has been difficult to obtain, and most milling companies were having a hard time of it. Small companies were no longer able to carry on their operations, and at the end of 1921, actual production was less than 60 per cent. of the potential capacity of the mills, about 14,080,000 bags a year.

THE TOA FLOUR MILL

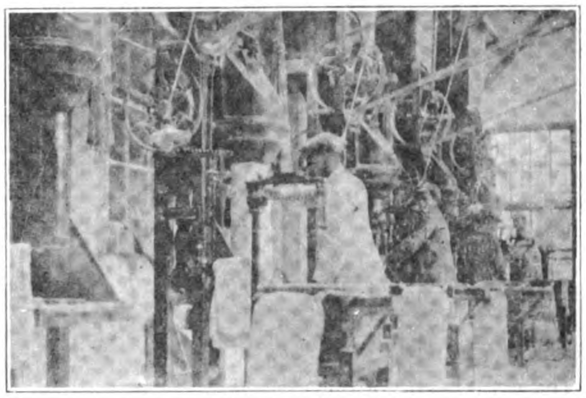


Power Room



Roller Mill Floor

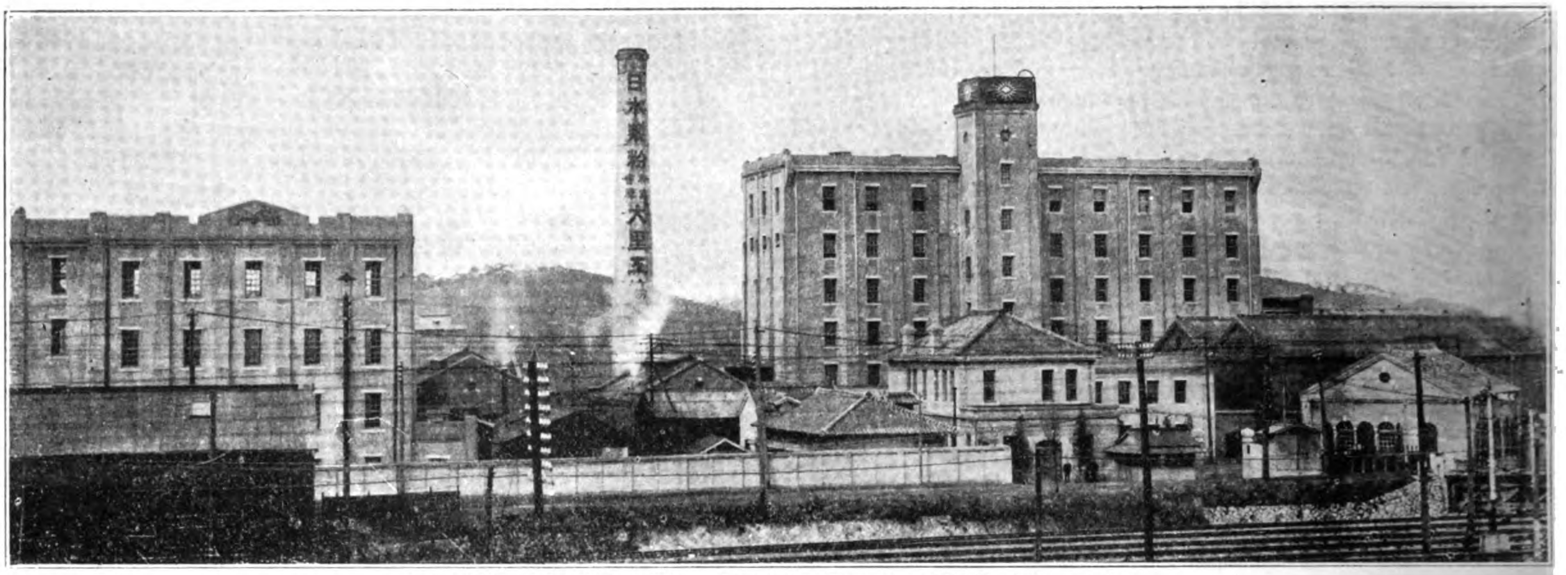
Bolting Floor



Packing Room

Productive Capacity of Japanese Flour Mills

Name of Company.	1914 barrels per day	1922 barrels per day	Location of Mill.
Kwanto District :—			
Nihon Seifun K.K. :			
Ogibashi Mill	400	—	Tokyo suburbs.
Onagigawa Mill	800	1,150	,, ,,
Sunamura Mill	600	800	,, ,,
Sendai Mill	—	100	Sendai
Sapporo Mill	200	300	Hokkaido
Takasaki Mill	—	600	Gunma prefecture
Koyama Mill	—	500	Tochigi prefecture



Dairi Mill of the Nihon Flour Company, Capacity, 1,500 barrels per day

Name of Company	1914 barrels per day	1922 barrels per day	Location of Mill.
Kwanto District :—			
Toa Seifun K.K. :			
No. 1 Mill	700	900	Tokyo suburbs
No. 2 Mill	—	2,100	,, ,,
Nisshin Seifun K.K. :			
Yokohama Mill	400	600	Kanagawa
Utsunomiya Mill	400	500	Tochigi prefecture
Tatebayashi Mill	1,000	1,200	Gunma ,,
Mito	—	700	Ibaraki ,,
Takasaki...	—	700	Gunma ,,
Matsumoto Seikoku Seifun K.K. :			
No. 1 mill	65	75	Saitama prefecture
No. 2 mill	200	200	,, ,,
No. 3 mill	—	500	,, ,,
Tsuchiura Seifun K.K.	30	50	Ibaraki ,,
Matsudo Seifun K.K.	65	65	Chiba
Shiraishi Kosan K.K.	65	65	Fukushima ,,
Uzen Seifun K.K.	60	60	Yamagata
Musashi Seifun K.K.	—	200	Kawagoe
Nitta Seifun K.K....	—	200	Gunma ,,
Saitama Kogyo K.K.			
Old Mill...	120	120	Saitama ,,
New Mill...	—	120	,, ,,
Chiyoda Seifun K.K.	—	300	Chiba
Sagami Seifun K.K.	—	100	Fujisawa
Nihon Kagaku Seifun K.K. ...	—	50	Chiba
Matsuda Seifun K.K.	—	30	Hamamatsu
Iwate Seifun K.K.	—	30	Senhoku district
Ryomo Seifun K.K.	—	200	Sano
Total 17 companies ...	5,080	12,540	
Aichi District (Nagoya as centre) :—			
Nisshin Seifun K.K. :			
Nagoya Mill	—	1,000	Nagoya
Shikishimaya Seifun K.K. ...	—	200	Handa
Mikawa Seifun K.K.	—	100	Okazaki
Nagoya Seifun K.K. :			
No. 1 Mill	100	200	Nagoya
No. 2 Mill	—	300	,,
Komiya Seifun K.K.	30	30	Miye prefecture
Total 5 companies... ...	130	1,830	
Kansai District :—			
Masuda Seifun K.K.	1,000	1,800	Hyogo
Nihon Seifun K.K., Hyogo Mill ...	700	1,200	Hyogo
Asahi Seifun K.K.	200	—	Kyoto
Nihon Seimai Seifun K.K. ...	250	300	Kobe
Masuda Seifun K.K.	1,000	1,000	Osaka
Nisshin Seifun K.K.			
Okayama Mill	—	1,000	Okayama
Uno Mill	—	200	Osaka
Shikoku Seifun K.K.	—	50	Tokushima
Awa Seifun K.K.	—	50	,,
Sakade Seifun K.K.	—	100	Kagawa prefecture
Total 9 companies... ...	2,250	4,800	

Name of Company.	1914 barrels per day	1922 barrels per day	Location of Mill.
Kyushu District :—			
Nihon Seifun K.K.			
Dairi Mill	1,600	1,500	Dairi
Kurume Mill	—	750	Kurume
Kyushu Seifun K.K.	—	200	Fukuoka prefecture
Total 2 companies... ...	1,600	2,450	
Grand Total 30 companies	9,060	21,620	

Millers say that the strong point in favor of the profitableness of flour mills is that they cost but little to erect when compared with other manufacturing industries, and also, that they require only a small labor force. But if production must be limited the business can not be such a fine one as they like to declaim. New mills erected since 1918 have been erected at very high costs, and the results of their business operations have been very dissatisfying to the shareholders.

Just at present raw material is high, and the manufactured product is cheap, so that the future of the flour industry is very problematic.

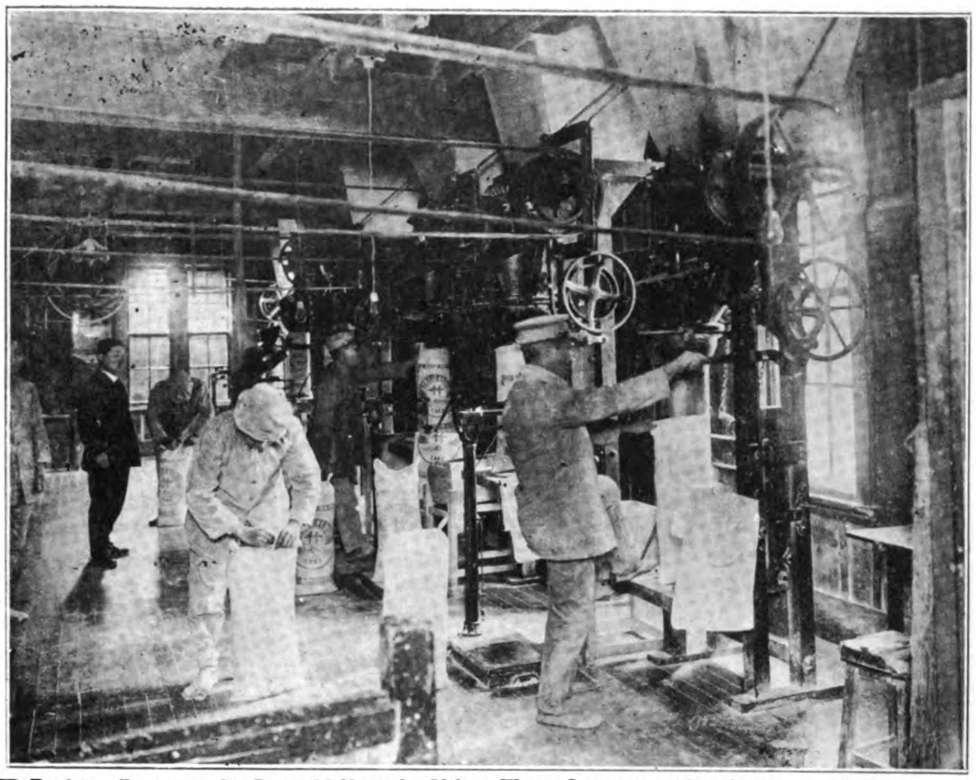
Flour Market To-day

Thanks to the period of seeming prosperity last year, from September, 1921, the flour industry took on a new lease of life. The price of flour bamboo brand, at one time reached Y.4.50 a bag. But during the first ten days of October, 1921, the price of flour in Japan took a heavy slump due to the decline in the price of wheat abroad, and also to the break in rice prices on the exchanges at home.

Since October, 1921, therefore, the price of flour has been continuously on the down grade, until it reached in January of this year the extremely low price of Y.3.70 a bag. But this low price helped the industry to recover because demand set in which raised prices by the middle of February to Y.4.25 a bag.

The recovery was largely due to the rise in the price of foreign-grown wheats. Australian wheat at one time quoted at Y.5.80 per 100 *kin* (133-lb.), C.I.F. Yokohama, recovered to Y.7.80. United States wheat rose from Y.6.00 to Y.8.00 per 100 *kin*, while Canadian rose in one bound from Y.6.20 to 8.90, C.I.F. Yokohama. The rise in price for practically all foreign wheat was approximately Y.2.00 per 100 *kin*. Japanese wheat, which had been very weak, at once took advantage of this situation in the foreign wheat market and rose in price, thus stimulating the market price of flour.

Then the very severe drop in rice the end of February depressed the flour market again, prices falling to Y.4.10 a bag. But foreign wheat more or less controls the actual price of flour in Japan, and foreign wheat continues to maintain high prices. And just at



Packing Room of the Dairi Mill of the Nihon Flour Company, Allis-Chalmer's Machinery

present summer demand is ruling the market, and this makes the prevailing market tone extremely optimistic and strong.

The recovery in the price of flour again attracted public attention to the flour milling companies on the stock markets. All flour issues registered market rises. The Nihon Seifun K.K. shares had been pushed down below par during the time of low-priced flour, but they have recovered and now stand at something like T.56.00, which is Y.6.00 above face value. This is a recovery of Y.18.00 compared with the low point reached in 1921. The Toa Seifun K.K. and the Nihon Seifun K.K. shares also rose on 'change.

Market Quotations of Leading Flour Issues

Company name	Paid Up Value	Low, 1921	High, 1922.
Nihon Seifun K.K. ..	Y.50.00	Y.38,00	Y.56.00
Nisshin Seifun K.K. ..	50.00	78.00	103.00
Toa Seifun K.K. ..	25.00	32.00	39.00

Because of the financial depression and the low price of flour, at a time when the cost of wheat was above the level at which it could be milled at a profit in Japan, the flour mills had a bad time of it for a while. Japanese-grown wheat was also at such a price that it could not be milled at all. Consequently all the Japanese companies turned their attention to buying foreign wheat at as low a price as possible. This was about the only way they were able to make both ends meet with any profit, even though it was very small.

In 1921 the importations of foreign wheat amounted to 293,000 tons, or 1,758,000 *koku*. This is an increase of 400,000 *koku*, compared with 1920. Most of this wheat was grown in the United States and Australia.

This foreign wheat was not only used to mix with Japanese-grown wheat, but in many instances it was used to replace the Japanese wheat entirely. This tendency to replace Japanese wheat with foreign wheat became more and more marked until the orders for wheat placed this year already exceed the amount bought in 1921.

Excluding the amount already imported the quantity to be shipped from March, 1922, is estimated at something like 295,000 tons, or 1,770,000 *koku*, from the United States and Canada and Australia.

Wheat Ordered for Shipment, 1922

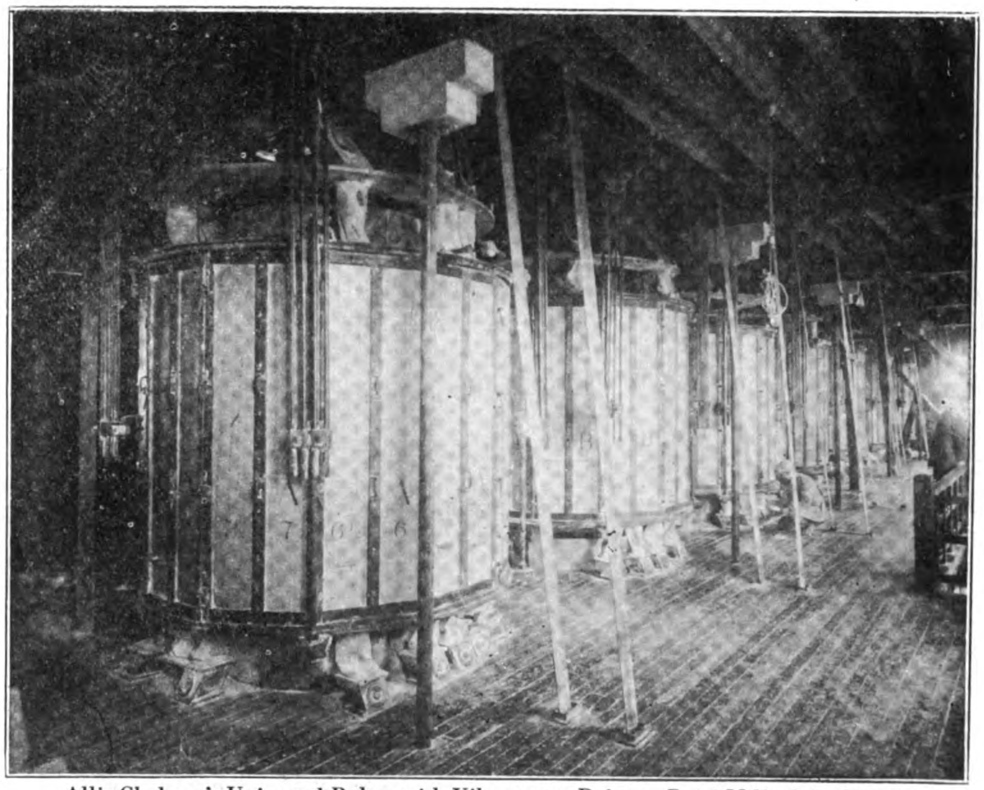
Country of Origin	Quantity	Value
Australia ..	180,000 tons	Y.18,000,000
United States	45,000 ,,	4,200,000
Canada ..	70,000 ,,	7,000,000
Total	295,000 tons	Y.29,200,000

Australian wheat gradually fell in price towards the end of 1921 because of the fears of Australian wheat growers about the future of prices after the decontrol of foodstuffs in October last year. Because of the low price of Australian wheat, Canadian and American wheat, assisted by the rise in the Anglo-American cross rate, fell also.

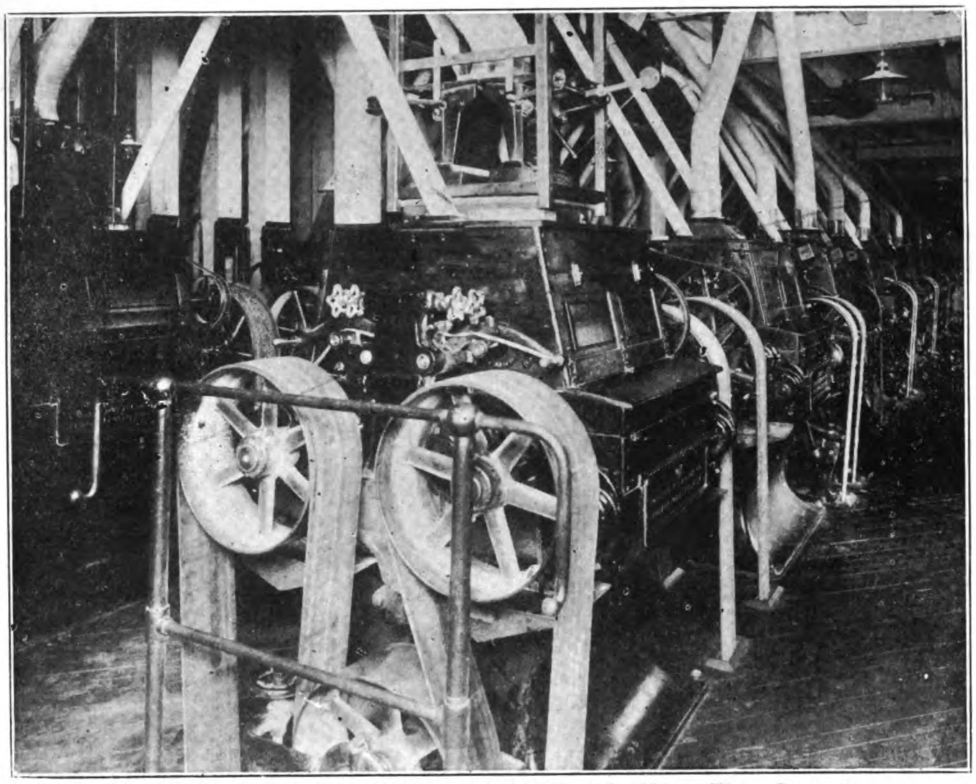
In November, 1921, American wheat was quoted at Y.6.00, while the C.I.F. price Yokohama was Y.6.20. The amount of Canadian wheat imported is the least, although Canadian wheat is the best quality the Japanese import. This was due to the fact that Canadian prices did not fall for some three months after Australian and American began to decline. The average purchase price of foreign wheat was Australian Y.5.50, and American and Canadian, Y.6.20 to Y.6.30, per 100 *kin*.

But the price of wheat suddenly recovered Y.2.00 per 100 *kin*, while the price of flour also rose by 50 sen a bag. Even with prices falling at the present time, they still remain about 30 sen higher than the lowest price reached last year. It is natural therefore that the future of the flour milling trade should not be considered so alarming.

The production of the mills was completely sold up to the end



Allis-Chalmer's Universal Bolter with Vibromotor Drive: Dairi Mill of the Nihon Flour Company



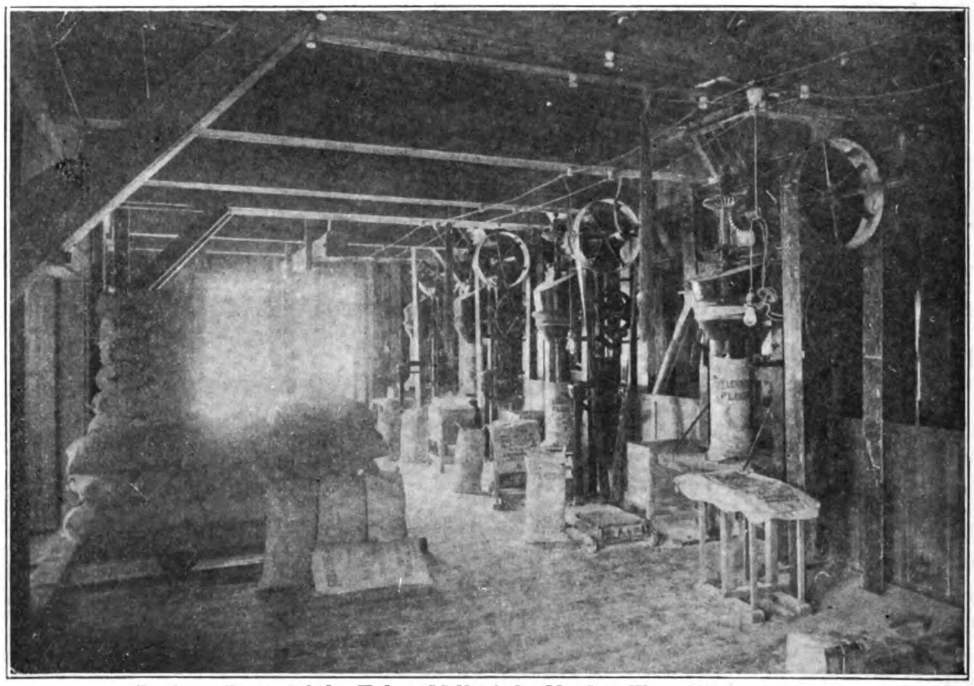
Allis-Chalmer's Roller Mills: Dairi Mill of the Nihon Flour Company

prices were at their lowest are making the biggest profits to-day.

It is impossible to learn just what amount of wheat has been purchased by each company. But from all information available it would appear that the Toa Seifun K.K. bought the greatest amount, at least compared with its productive capacity, of any company in Japan, while comparatively, the Nisshin Seifun K.K. bought the least. But when the total amount of wheat purchased is considered the Nihon Seifun K.K. bought the most, and the Toa Seifun K.K. the least of the three big flour companies. Whether these companies will show good results this term remains to be seen, but the general tendency is to be hopeful.

After the outbreak of the war the flour milling companies were uniquely prosperous, but from the end of the first term of business in 1920 (May), things have been going from bad to worse. The three big companies at once adopted a policy of watchful waiting. They made no capital changes, and called up no new payments on issues outstanding. The Toa was the only company to increase its capacity, by 1,000 barrels, while the Nihon became somewhat more strong by some amalgamations of minor concerns. All the companies reduced production to the minimum of demand, and naturally their income shows great decreases.

of March, 1922. The production will, therefore, not be thrown on the market for sale at any price. Consequently it does not seem that matters are in any very unfavorable state for the profits of the flour mills.



Packing Room of the Tokyo Mill of the Nisshin Flour Company, Ltd.

Cost of Production

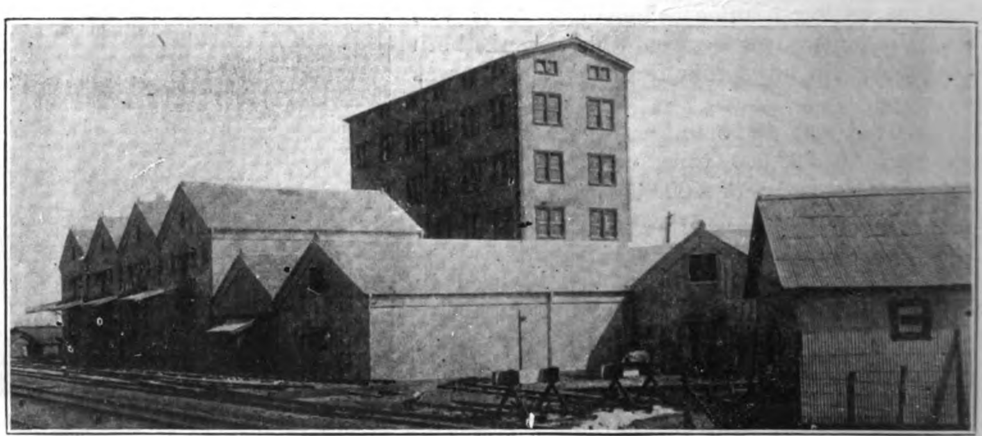
Estimating the price of wheat C.I.F. Yokohama at Y.6.50 per 100 *kin*, when duty and certain minor costs are paid, it mounts to Y.7.50 per 100 *kin*. Estimating two bags of flour from 100 *kin* of wheat, the net cost of flour is Y.3.75 a bag.

The flour mills have been refusing sales at less than Y.3.80 a bag and with the exception of quantities dumped by the weaker concerns, there has been little flour for sale under the fixed price. Consequently the flour mills have been making a profit of 5 sen a bag. The recent improvement of prices has greatly increased this profit, and as millers who are not acting in the price agreement are also profiting by this advance. It may accordingly be believed that the business results of the flour mills this half year, December, 1921-May, 1922, will be quite satisfactory to the shareholders. Unfortunately there are some mills which bought foreign and domestic wheats at high prices. Those who bought the largest amount of foreign wheat when

The Three Big Companies

From the points of capital and productive capacity the greatest flour milling company in Japan is the Nihon Seifun K.K. Its capital authorized May 31, 1921, was Y.11,-550,000, of which Y.5,625,000 was paid up. On the same date it had loans unpaid amounting to Y.4,000,-000, and reserves of Y.2,710,000.

In the first half of 1920, ending May 31,



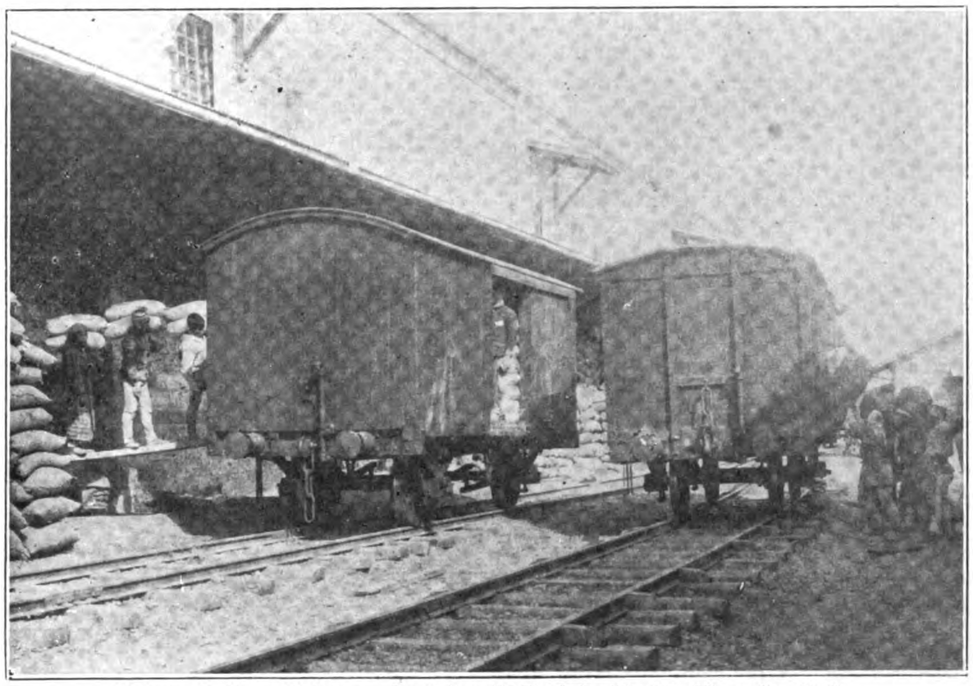
No. 2 Tokyo Mill of the Nisshin Flour Company

1920, it earned Y.2,056,000 about 50 per cent. of its paid-up capital. One year later during the first half of 1921, its profit was only Y.42,000, about two-tenths of one per cent. of its paid-up capital. This has been an ordinary matter for most companies which were paying 20 per cent. dividends the beginning of 1920 were passing them by the beginning of 1921.

The Nisshin Seifun K.K., on May 31, 1922, had an authorized capital of Y.4,500,000, of which Y.3,100,000 was paid up. It reported no loans unpaid, and had reserves of Y.1,578,500. This company shows little change between 1920 and 1921. On May 31, 1920, its profits were Y.1,174,000, a year later they were only Y.510,000. But this decrease is very slight compared to the results of the Nihon Seifun's business.

The Toa Seifun K.K. showed a great decrease in profits between the first term of 1920 and the first term of 1921. Its authorized capital, May 31, 1922, was Y.2,500,000, of which Y.1,250,000 was paid up. It reported no loans unpaid, and owned reserves amounting to Y.238,523. But profits fell from Y.356,000, in 1920 to Y.122,000 in 1921.

The total profits of these three companies at the end of the first term in 1920 was Y.3,586,000, which declined by the end of May 31, 1921, to only Y.674,000, or approximately one-fifth. The profit rate, figured on paid-up capital, decreased from 74.5 per cent. to 14 1/7 per cent.



Private Railway Siding to the Tokyo Mill of the Nisshin Flour Co., Ltd.

At the same time the rate of dividend paid by the three companies decreased from an average of 24 per cent. to 9.3 per cent.

But the business results of all three companies showed improvements during the second half of 1921. Nihon Seifun profits reached Y.412,000, Nisshin profits were Y.613,000 and Toa profits, Y.182,000. This almost doubles the rate of profit and dividends increased to an average of 15 per cent. in the second half of 1921.

The Nisshin Seifun K.K. always retains 20 per cent. of profits as reserve. Consequently the percentage of its reserves, to its paid-up capital, is always much greater than that of the other companies.

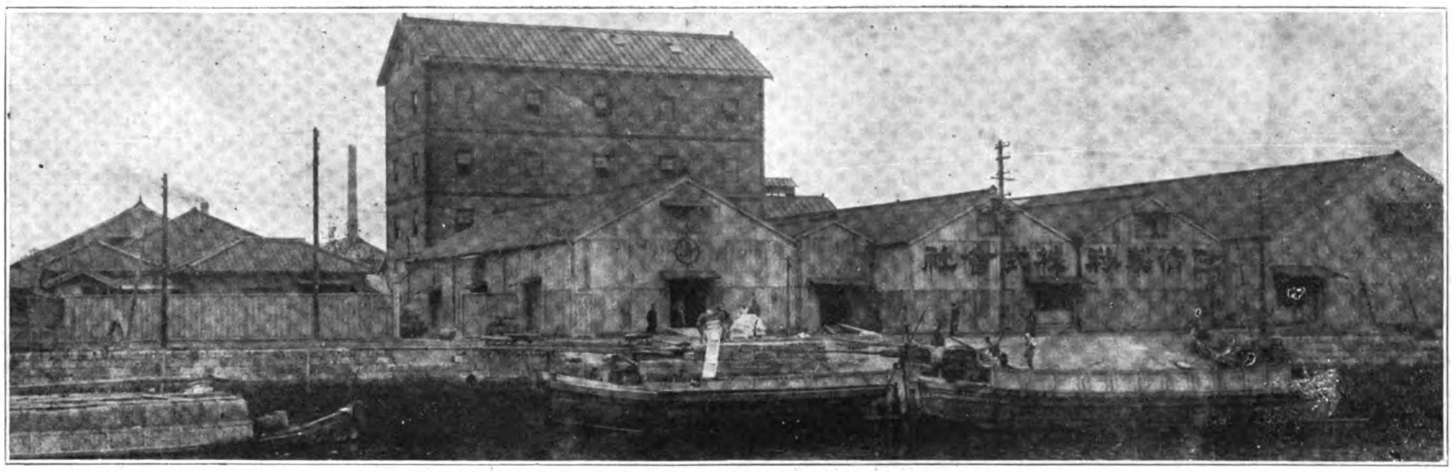
The fixed capital investments of these three companies per barrel of productive capacity are as follows :

	Fixed Capital	Productive Capacity	Fixed Capital per barrel
Nihon Seifun K.K. ..	Y.14,658,000	25,166 Bbls.	Y.5,824
Nisshin Seifun K.K. ..	7,639,000	14,961 ,,	5,039
Toa Seifun K.K.	3,131,540	10,505 ,,	2,981

To-day the principal factor affecting the profits of flour milling companies is their purchase of cheap raw material, and in their method of marketing their products. The Nisshin bought raw material in a cleaver manner thus increasing its profits. But the Nihon Seifun failed to purchase cheap Australian wheat, and consequently received a blow from which it has not yet recovered. This company resorted to the over-estimation of its real estate by Y.2,400,000 in its last term 1920, thus showing a fictitious profit. It has not yet recovered from this blow to its prestige in the financial market.

The profit-making ability of these three companies is as follows :

Company	Capacity barrels	Profit	Profit per barrel of Capacity
Nihon Seifun K.K. ..	6,900	Y.412,000	Y.5.97
Nisshin Seifun K.K. ..	5,700	613,000	10.75
Toa Seifun K.K.	3,000	182,000	60.65



Yokohama Mill of the Nisshin Flour Company

Steel Direct from Ore

Blast Furnace Eliminated from Steel Making

A Tribute to British Commercial Honor

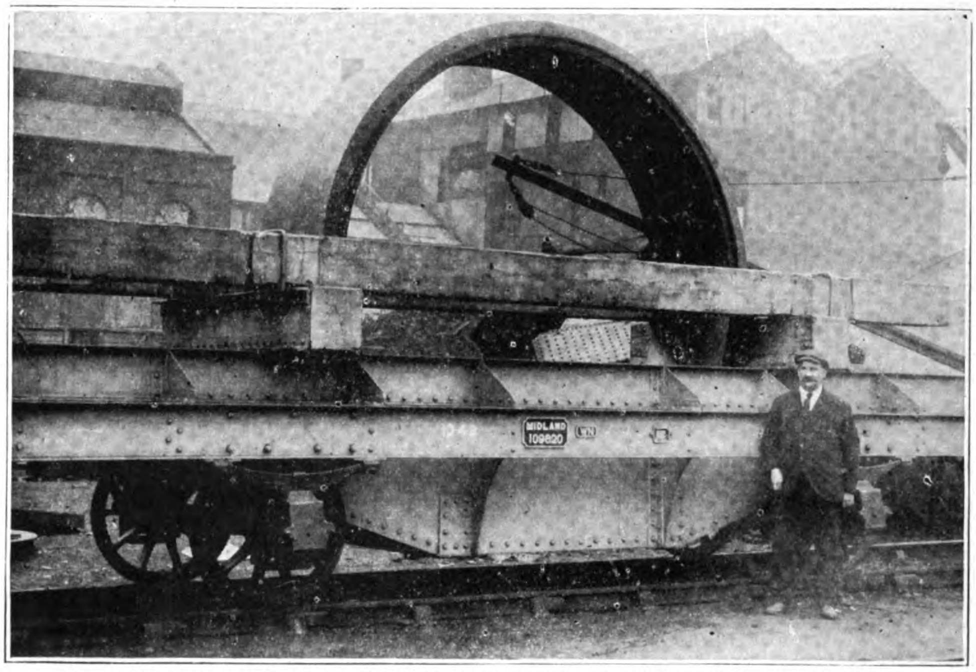
THE production of steel direct from the ore has been the dream of metallurgists for years, and though many experiments, in a small way, have from time to time been made by eminent scientists, the problem, if not actually solved, has been at least allowed to remain in abeyance for all practical purposes, chiefly because it was found that any of the new processes were so costly as to make the production of steel by them an uneconomic proposition.

A few years back, however, it was mooted in metallurgical circles, that a French metallurgist, M. Basset, had at last discovered a method by which steel could be produced direct from the ore at a cost which would ensure commercial success. The Frenchman kept his secret well, and, though, at the time, there were many sceptical remarks on his claim to have succeeded where others had failed, none was quite sure of the lines upon which he had been working. Nothing had appeared in any of the technical journals, and, the debates at scientific societies either in Sheffield or in France were strangely silent on a matter, which, if all that is claimed for it is correct, promises to revolutionize the whole of the iron and steel industry of the world.

The Dream of Years

A visitor to the railway sidings at the works of Messrs. Edgar Allen & Co., of Sheffield, last February would have found ample food for assuming that, whatever the sceptics may have had to say, the great French metallurgist is at least satisfied that he has brought the dreams of his fellow-scientists within the bounds of practicability. For there, on no less than twenty-nine trucks (fifteen of which were of a specially large size to receive their load) was securely packed, the first unit of a plant, which is going to attract the attention of the steel and metallurgical world.

It was a wonderful sight. Two of the most powerful engines of the Midland Railway Company stood hissing steam from their safety valves; behind them, on the quarter of a mile of trucks, lay a collection of the most unique and conglomerate mass of iron and steel that has ever been seen on the rails either in this or any other country. In Sheffield, there were a dozen or so cylindrical tubes, some measuring ten feet in diameter, and others measuring eleven feet eight inches, nestling snugly in their wooden beds and lashed down securely with great chains. They reminded one of the sections of a large funnel of an Atlantic liner. There, standing in a slanting position on ends, were large cast-steel riding rings, measuring 13-ft. 6-in. in diameter, and weighing 8 tons each. To have laid them on the flat meant exceeding the gauge limit and to have put them in an upright position would mean the sweeping away of bridges and tunnels perhaps. Behind them lay an assortment of weird and wonderful machinery all destined to play its part in the great invention.



One of the Special Trucks designed to transport the special machinery made at the Edgar Allen Works, for a new process steel plant in France

Big Transport Problem

As the hooters of the surrounding works sounded the hour of one o'clock, the mighty mass of metal moved slowly off to the accompaniment of much puffing and snorting of steam by the locomotives which were severely tested in their efforts to get their cargo under way. It was estimated that in all there were some 1,000 tons of machinery on the move, 200 of which, represented the weight of the plant being shipped to Domicile, France. The operation was watched with the greatest anxiety by the directors, staff and workmen of the firm, who were naturally desirous that their latest product should not suffer any mishap at the outset of its journey. The difficult task of conveying the goods to their French destination was entrusted to the expert hands of Messrs. Henry Johnson Sons & Co., Norfolk Row, Sheffield.

For the transport of the machinery to Hull, the Midland Railway Company had to make special arrangements to ensure safety. From that port it was shipped by special steamer to Rouen, from whence it was taken by rail to Domicile. So fraught with danger is the transporting of the huge mass, that Messrs. Johnson's French representatives had to make special arrangements with the French railway authorities for its handling.

As stated, little is known of the actual details of M. Basset's process. So desirous was the inventor that as little as possible should be known of his work, and so great was his faith in Messrs. Edgar Allen & Co., that he stipulated there should be no sub-contracting. Therefore, the whole of the plant has been constructed at the famous Tinsley Works, and the section despatched last February only represents one-third of the whole order.

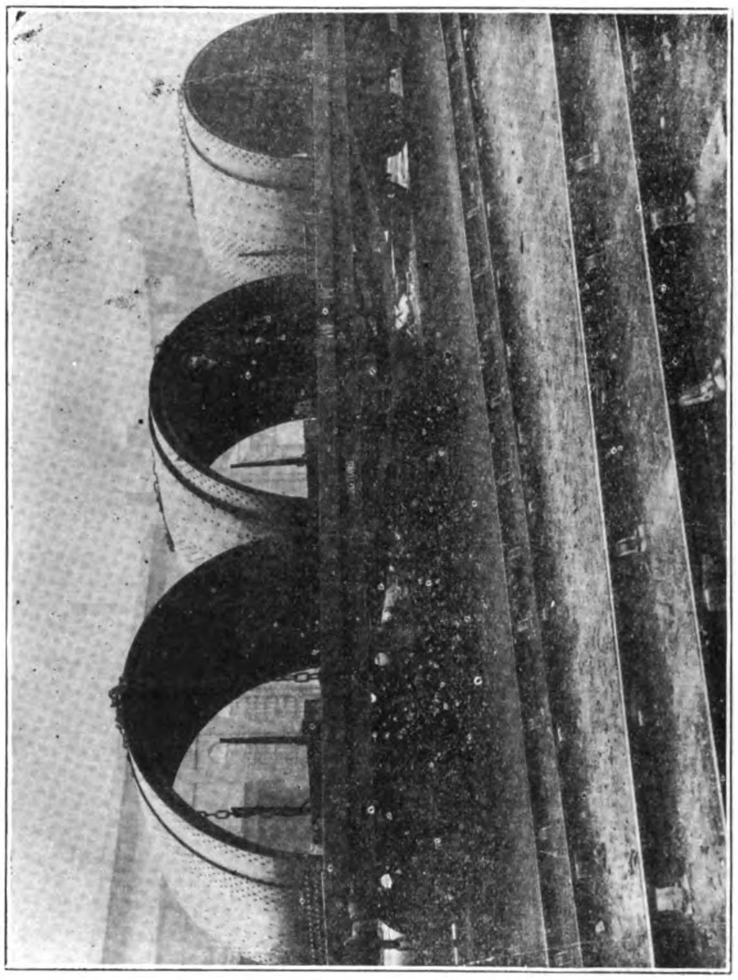
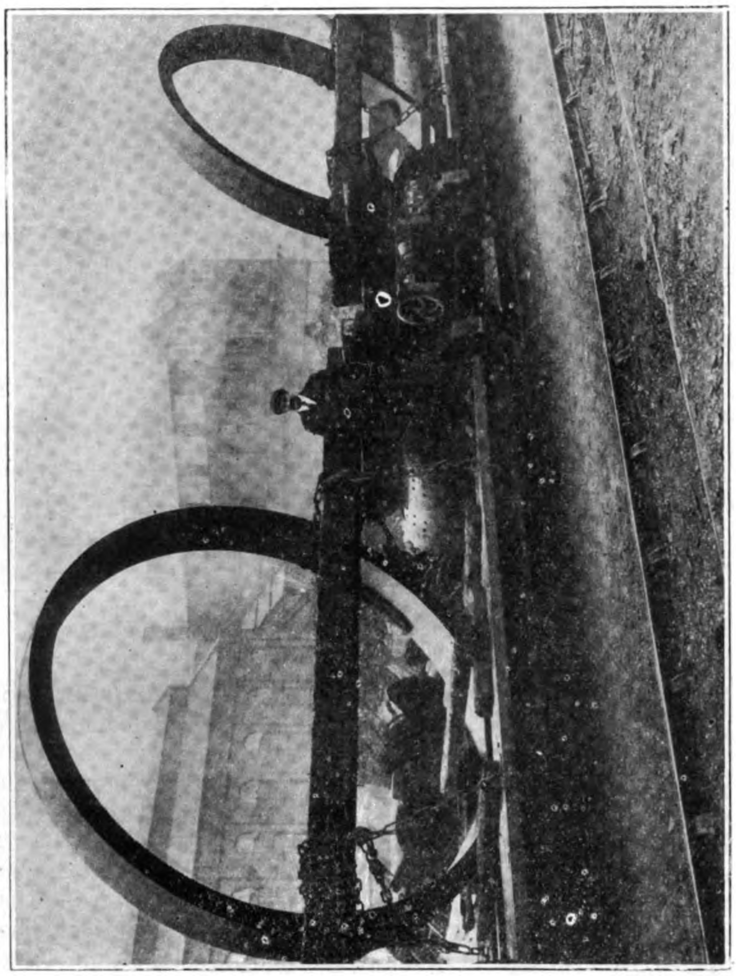
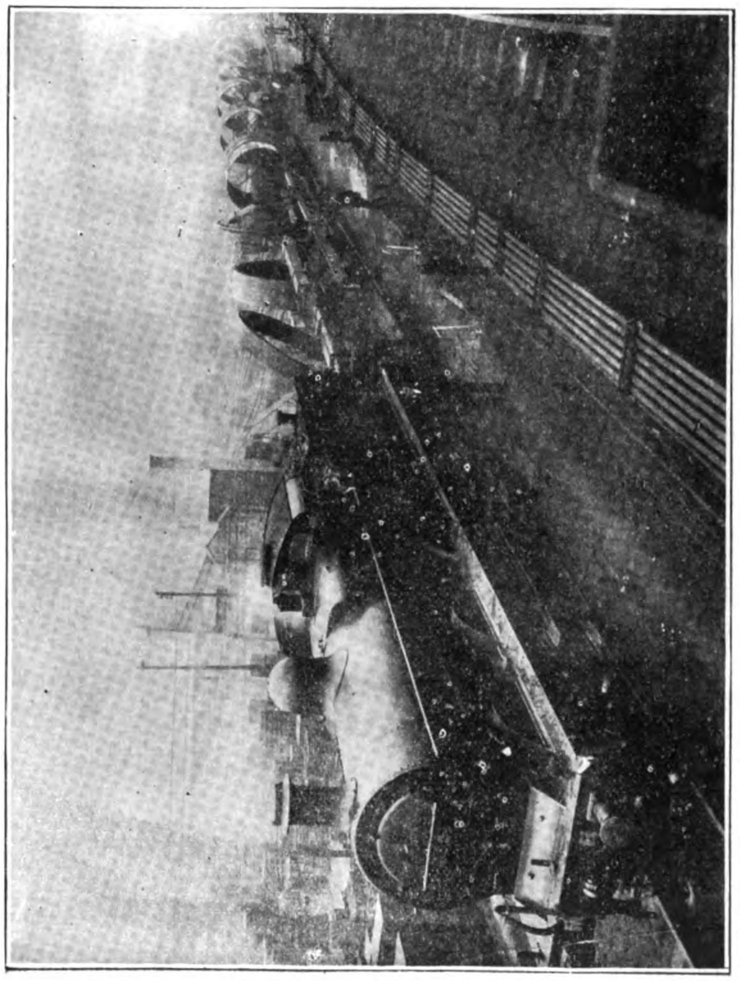
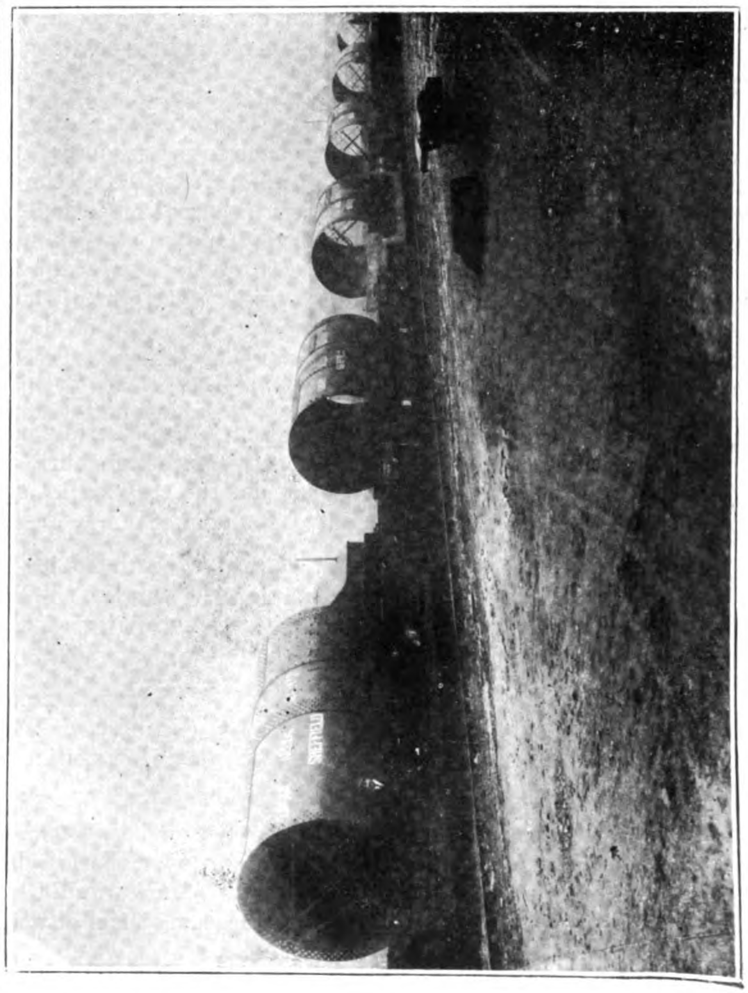
Tribute to Sheffield

It is a tribute to the firm to say that their craftsmanship, and the discreet manner in which the inventor's wishes regarding secrecy were observed, have earned the whole-hearted approbation of M. Basset. Sheffield, the home of the steel trade of the world, was entrusted with the manufacturing of a plant which bids fair to revolutionize its staple industry, but Sheffield, outside Messrs. Edgar Allen's works, knew nothing of it! Such commercial integrity will redound to the everlasting credit of the firm and add yet another link to the city's reputation as a place where business men, either at home or abroad, can have a fair and square deal.

The basic principle of the Basset process is somewhat akin to the rotary kiln of a cement works. The use of the last furnace is entirely eliminated, and this, of course, is the important factor when the cost of producing steel is taken into consideration. Into revolving cylinders, some 200-ft. long, the ore

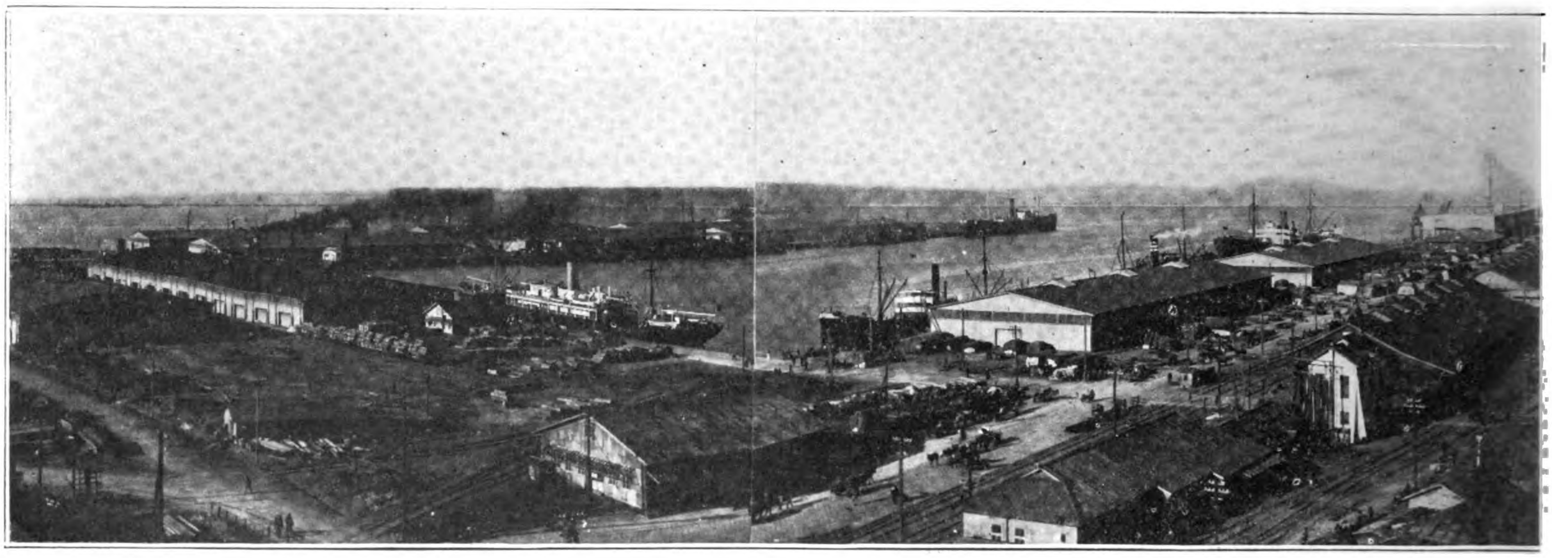
will be projected at one end, and, as it works its way towards the other it will be fired with pulverised coal, much in the same way as a rotary cement kiln. The cylinders will, of course, be lined with firebrick, and when revolving will weigh about 400 tons each. Such in brief is the method, the success or otherwise of which is keenly awaited by the whole metallurgical world.

THE PLANT EXPECTED TO REVOLUTIONIZE STEEL MAKING

The first shipment of twenty-nine trucks of special machinery made at the works of Edgar Allen & Co., of Sheffield, for erection in France, where the manufacture of steel will be attempted without the use of blast furnace

DAIREN



PANORAMA OF

THE rise of Dairen to the second port of China is one of the marvels of Far Eastern development, an indication of what can be done in other parts of China under an efficient and honest government. Twenty years ago it was a mud hovel fishing village, to-day, the gateway to one of the richest empires of the world, the land of to-morrow. The grand plans of Russia for the development of this port have been carried out and magnified many times by the South Manchuria Railway Company, whose development of the soya bean and the coal of Fushun provides freight for the railway and cargoes for the fleets of steamers that now enter and clear from the port. Dairen is the outlet and inlet, the commercial metropolis of the vast region that in the next quarter century will loom large in the pages of history.

The port works are being constantly improved to handle the increasing volume of trade. New concrete warehouses with special cargo-working appliances are taking the place of the old open-storage system, a beautiful modern fireproof office building houses all the different harbor offices, and special equipment of all kinds has been installed to take care of the many different requirements of loading and unloading vessels. The port of Dairen is up-to-date, the best equipped in China. Some idea of the advances that have been made in the port under Japanese direction may be gleaned from the following official figures :—

Port of Dairen.—The port of Dairen is the starting point of the South Manchuria Railway and a gateway to Manchuria and Mongolia, the staple products of which find the only outlet open all the year round. It is also the only free port in the Far East.

Dalny under Russia.—Russia, eager to secure an ice-free port in the Far East, leased for the term of 99 years the so-called Kwantung leased territory, in the southern extremity of Liaotung peninsula, by virtue of the Russo-Chinese treaty in 1898.

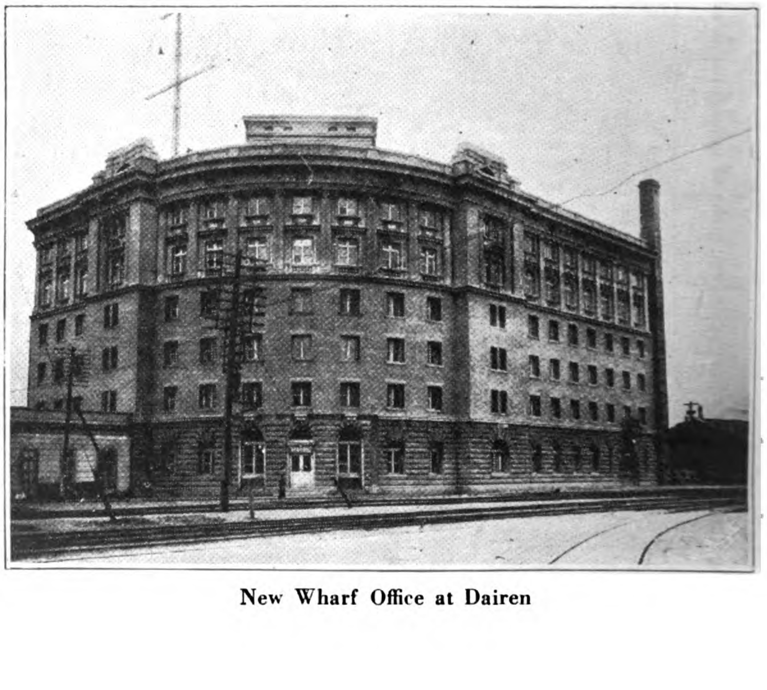
Russia started immediately afterwards to construct a commercial port on an extensive scale, which was then styled Dalny meaning "Far Away" in Russian, and which has been destined to grow up into the present port of Dairen.

Under Japanese Management.—In September, 1905, in terms of the Portsmouth treaty, Japan took over the leasehold above mentioned and established the South Manchuria Railway Company with the object of improving the economical situation of Manchuria work of reconstruction, extension and fresh construction has been energetically carried on at an enormous outlay and the port of Dairen has become what it is to-day.

Dairen can now accommodate vessels to the extent of 150,000 tons at a time. The aggregate annual exports and imports reached 4,500,000 tons.

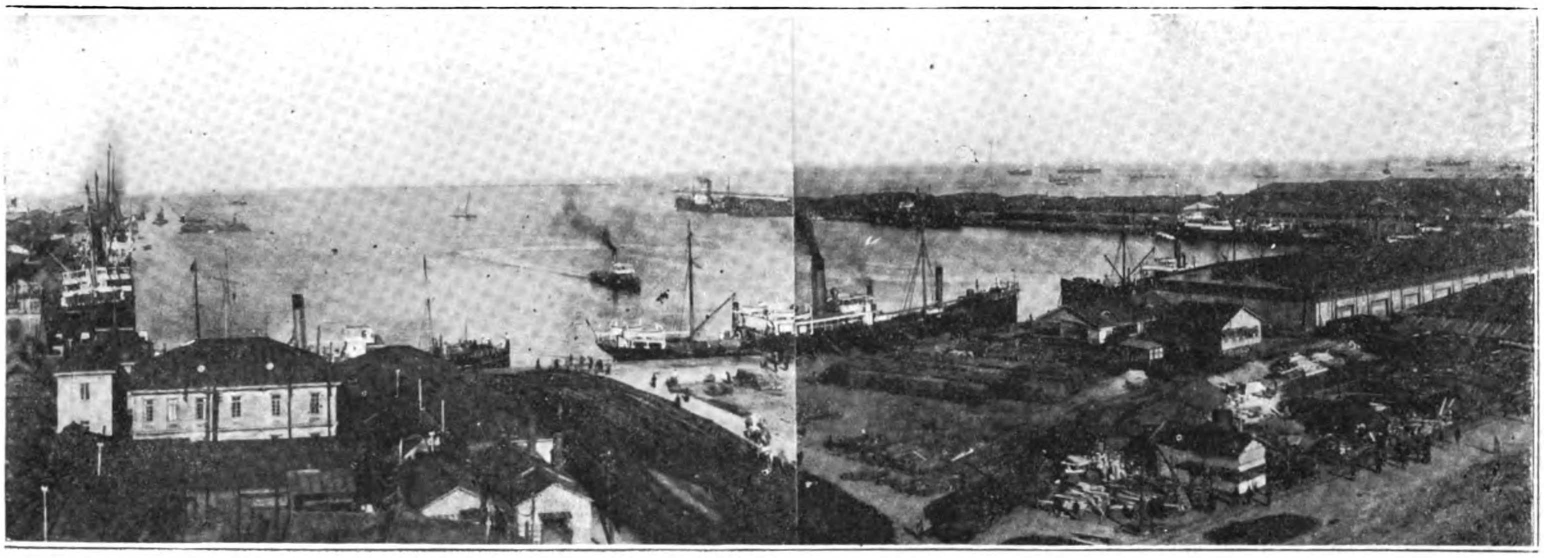
Free Trade Zone.—By the provisions of the Russo-Chinese treaty, the Kwantung leased territory remains a free trade zone.

Cargo-work.—Cargo-work at Dairen is in principle conducted along the quay wall. When no berth is left available, cargo-work may be done by lighters. As more or less difficulty attends on the berthing and unberthing of vessels, the compulsory pilotage system is instituted and operated over vessels of over 1,000 tons gross. The pilotage need not, however, be borne by the vessel. Nor is any wharfage charged. Only, as fee for the use of steam launches, etc., at the time of berthing and unberthing, a tariff of charges for the same is charged. In this respect, Dairen finds not alike among the ports in the Far East. It may be considered as a substantial favor to the vessels calling at Dairen.



New Wharf Office at Dairen

HARBOR



DAIREN HARBOR

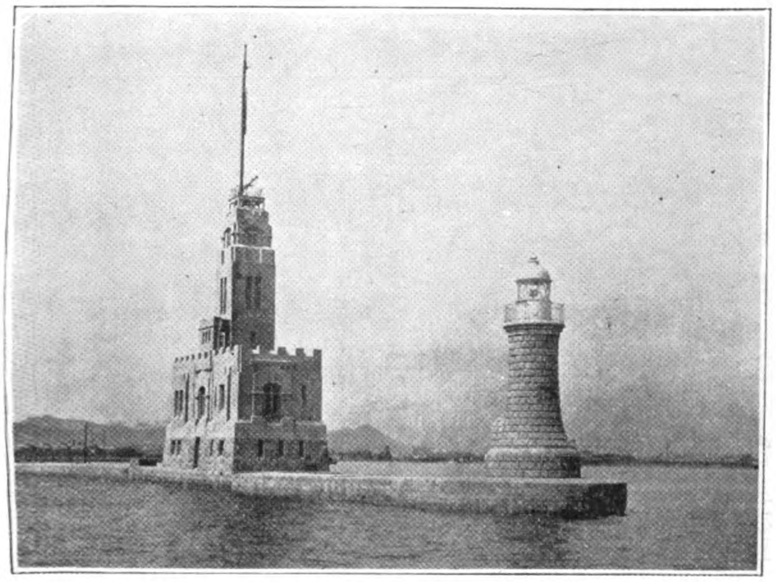
Cargo-working Equipments.—No special equipments worth mentioning exist at present in the line of cargo-working facility. Coolie labor is depended upon almost wholly. In efficiency, however, coolie labor quite holds its own against mechanical working. Besides, because of its cheapness, the low rates obtaining at Dairen in cargo-work and other charges have no parallels elsewhere in the world.

Chinese Coolies.—Chinese coolies are generally of mild disposition and well suited to employment in a gang. Shantung is the principal source of supply of coolie labor.

The exports of Dairen consisting mainly of agricultural products there are distinctly busy and dull seasons. The busiest season begins about the middle of November each year and lasts till about the middle of the following March. In summer, things usually move slowly, and it is often called the dull summer spell.

A tendency has appeared lately to bring both extremities nearer together.

Climate.—The climate may well be called a continental one. It is intensely cold during the busy season, and more or less difficulty is met in cargo-work at times. But never has the surface of water in the harbor got frozen so badly as to make it impossible for a vessel to come to, or leave the wharves. So far the thickest ice formed in the harbor was about 10 inches. However, as the service of ice-cutters is always available, no hindrance has been felt to the access of shipping. It may be added that the larger-typed launches belonging to the wharf office are all equipped with ice-breaking appliances.



Entrance to Dairen Harbor: Light House at end of Breakwater

Wind.—There is a strong north wind prevailing in winter, but no serious difficulty is experienced. In other seasons, there is no local wind.

Current.—No current runs in the harbor of Dairen, and this facilitates ship's access.

Fog.—It is foggy about the months of May, June and July, and the fog is often a menace to the shipping. There is, however, a foghorn installed on South Sanshantao Island at the entrance to the Dairen harbor. The foghorn is audible at the distance of 10 miles outward. Besides, a light-house showing a white revolving light stands on the same island. The light is visible 21 nautical miles off in clear day.

Wireless Station.—The Dairen bay wireless station is situated at Shatozu Takushan, about 11 miles eastward.

Wireless messages are accepted at the Dairen post office.

Harbor Administration and Management.—The harbor administration is attended to by the marine bureau of the Kwantung government. The maintenance, reconstruction and repair, extension, etc., of the harbor and its accessories are all looked after by the South Manchuria Railway Company. The management of the Dairen wharves belongs to the wharf office.

Wharf Office.—The wharf office is divided into the four offices of secretary's, shipping, goods and yard, and employs about 1,700 officials and employees.

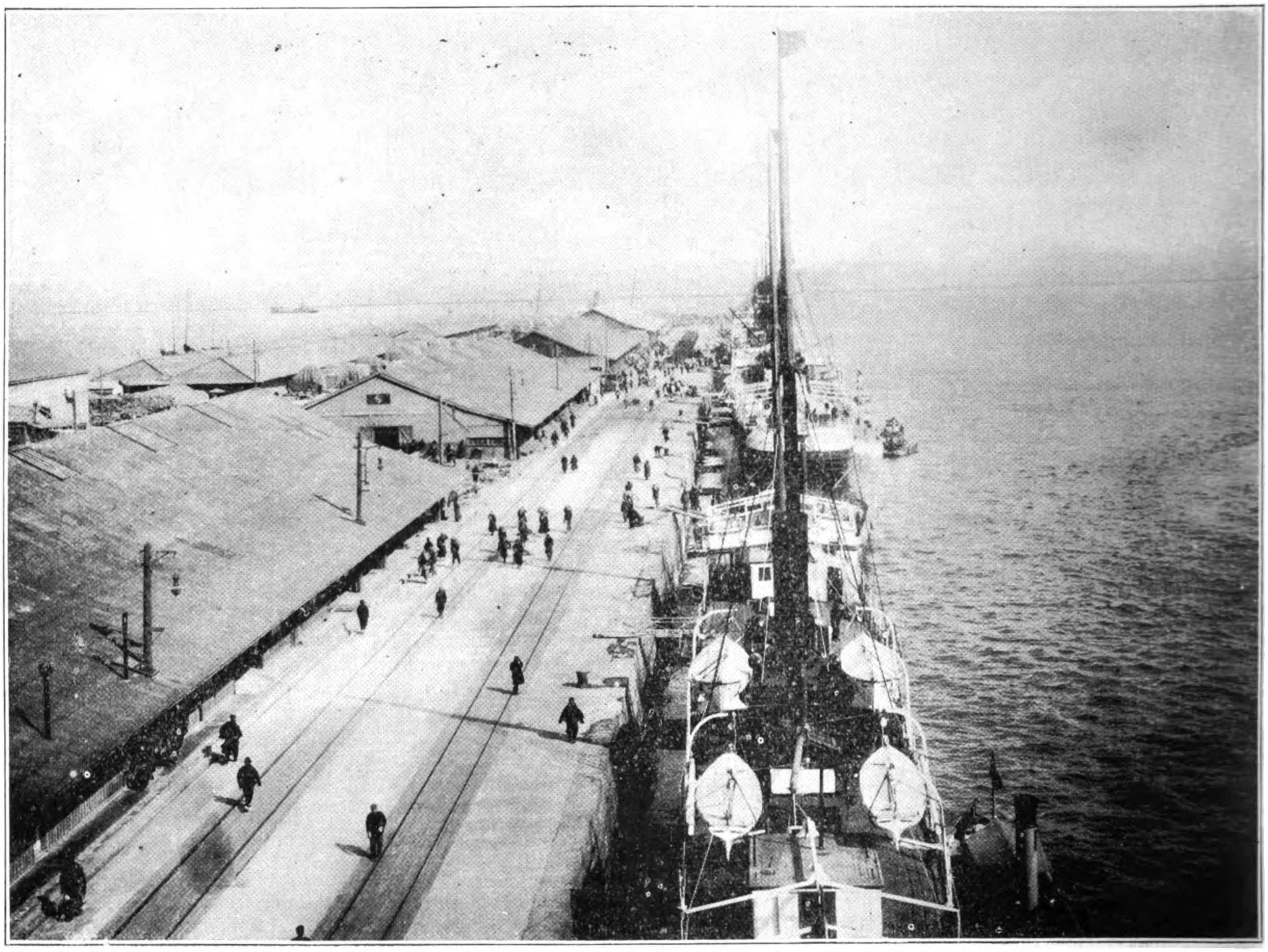
The principal businesses of the wharf office are cargo-work, terminal loading and unloading of railway goods, and warehousing. Sundry services appertaining to these businesses are also conducted.

Goods in storage (under custody, on application) are covered by fire insurance without the owners' expense.

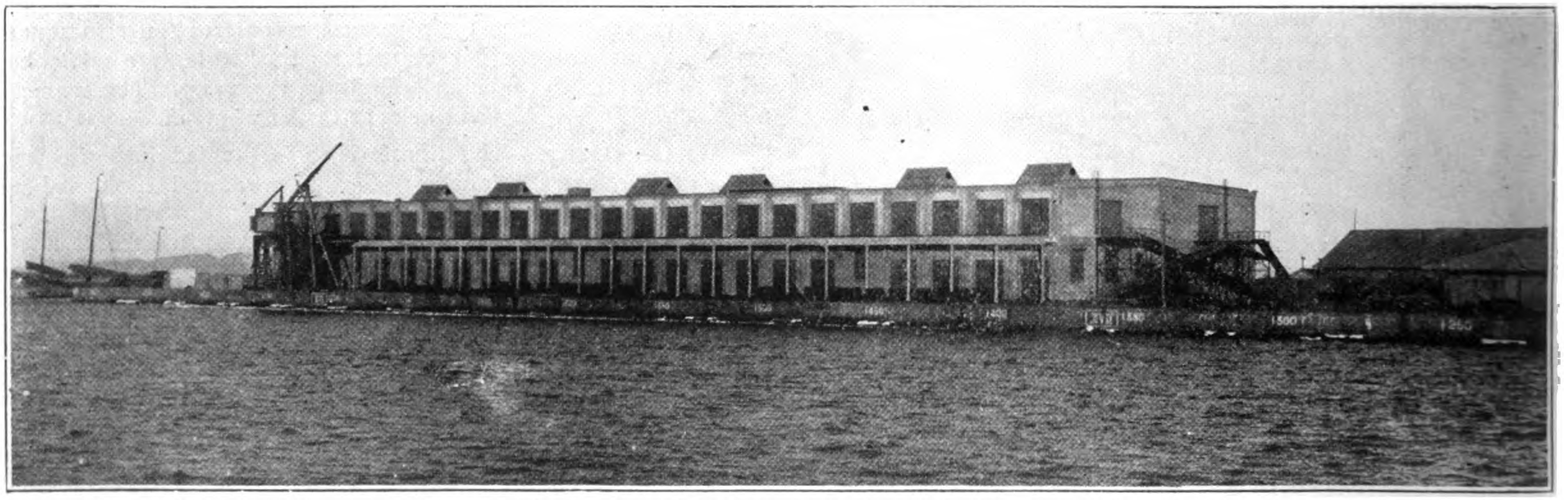
The different schedules of charges are as follow :

1. Baggage and freight tariff.
   Warehousing charges.
2. Regulations concerning cargoes and vessels.
3. Specific charges on the wharves.

THE BEAUTIFUL HARBOR OF DAIREN



Mail Steamers at the Dairen Wharves



One of the Several Permanent Concrete Wharves and Warehouses of the New Wharf System of Dairen Harbor for the Storage and Handling of the Immense Soya Bean Shipments which pass through the Port

EXTRACTS FROM STATISTICS :

	Vessels berthed. (Gross tonnage)	Exports & Imports. (Short ton)	Railway Goods Arrived & Despatched (Short ton)
1911 ..	2,662,943 tons.	1,407,761 tons.	1,195,271 tons·
1912 ..	2,872,122 ,,	1,557,320 ,,	1,427,169 ,,
1913 ..	3,556,250 ,,	2,105,985 ,,	1,995,385 ,,
1914 ..	3,838,078 ,,	2,104,590 ,,	1,976,951 ,,
1915 ..	3,461,530 ,,	2,270,036 ,,	2,203,777 ,,
1916 ..	3,095,257 ,,	2,331,446 ,,	2,308,781 ,,
1917 ..	3,118,715 ,,	2,988,856 ,,	2,662,517 ,,
1918 ..	3,473,397 ,,	3,447,699 ,,	3,092,468 ,,
1919 ..	4,380,920 ,,	4,223,775 ,,	3,554,613 ,,
1920 ..	4,864,904 ,,	4,038,851 ,,	3,834,899 ,,

BREAKWATERS :	East Breakwater	1,221-ft.
	North ,, ...	7,400 ,,
	West ,, ...	4,500 ,,
	Total	13,121 ,,

ENTRANCES : East entrance (main) 1,200-ft. in width.
North ,, (for sailing ships and steam launches.) 400-ft. in width.
West ,, (,, ,,) 200 ,, ,, ,,

WATER AREA : Inside breakwaters, 3,135,000 square metres. (actually available about 3,036,000 s.m.)

BERTHING QUAY LINE :

	Length.		Length.	Total.
First wharf	2,525-ft.	Wharf "A"	1,225-ft.	13,450-ft.
Second ,,	4,400 ,,	,, "B"	900 ,,	
Third ,,	4,400 ,,			

BERTHING SECTIONS : 34 each, being 400-ft. in length.

INFLAMMABLE GOODS PIER : 1,135-ft. in length.

DEPTH IN BASIN : 30-ft. L.O.S.T. (low water ordinary spring tide.) Difference between high & low water, 8-ft.

STEAM LAUNCHES (for berthing & towing purposes) : 14 in number.
Largest, 224 tons gross.
Smallest, 11 ,, ,,

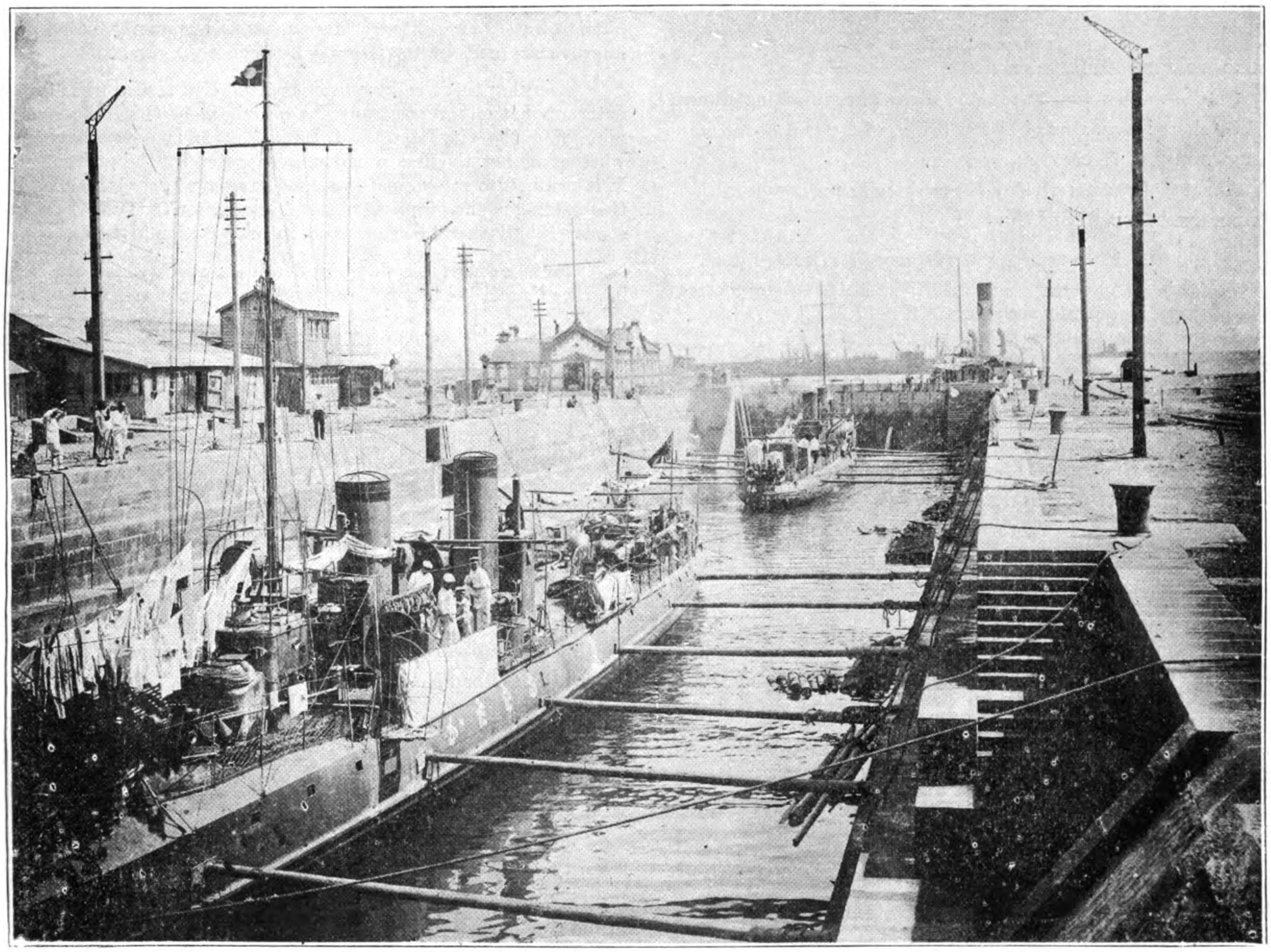
LIGHTERS (built of steel) :
12 in number.
Capacity .. {250 tons, 5 in number. 100 ,, 7 ,, ,,

SHORE INSTALLATIONS. (Wharf compound being about 1,485,-000 square metres).

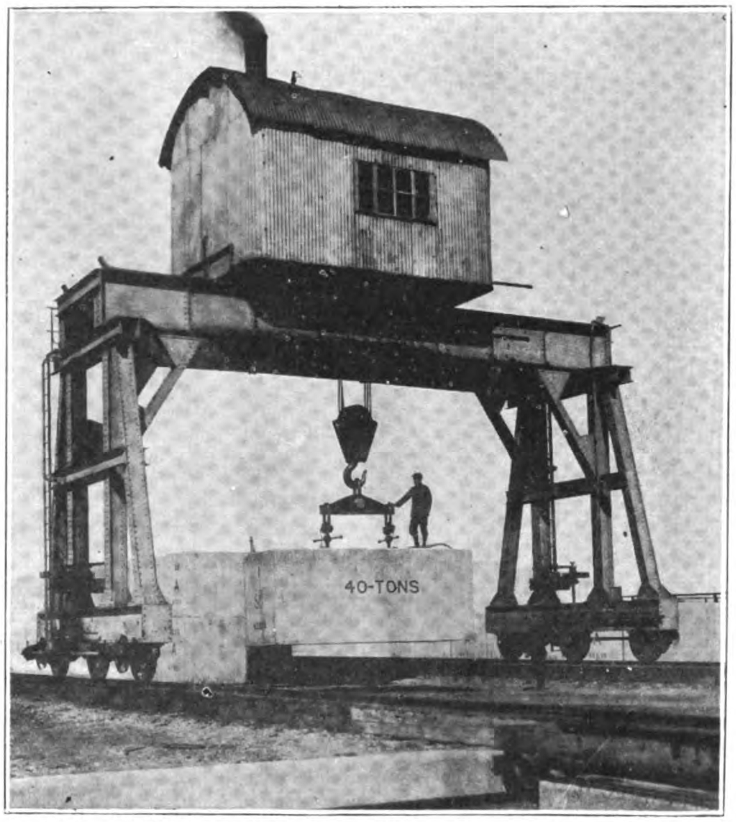
WATER SUPPLY : Hydrant for each berthing section, capable of supplying about 60 tons per hour.

WATER BOATS : Two, each capable of supplying 30 to 50 tons per hour.

COALING EQUIPMENTS : Sections 1, 2 and 3 are set aside for coaling. Bunkers can be supplied direct from coal cars. Lighters also available.
(Coal yard on the coaling sections can store about 80,000 tons.)



The Dry Dock at Dairen, Owned by the South Manchuria Railway Company and Operated by the Kawasaki Dockyard Company, Ltd. Only Dry Dock in North China Capable of Admitting Ships up to 6,000 tons



Dairen Harbor Works: Gantry Crane Transporting a 40 ton Concrete Block

CARGO-WORKING EQUIPMENTS:

On the water; two 50-ton and three 25-ton floating cranes.

On shore: a number of 1½-ton, 3-ton, 15-ton and 25-ton cranes.

CARGO-WORKING CAPACITY:

About 20,000 tons per day (10 working hours).

WAREHOUSES AND GOODS SHEDS:

	Number	Storage area.
Ordinary warehouses ..	57	246,444 square metres
Inflammable goods warehouses	9	7,227 ,,
Temperate warehouses ..	1	792 ,,
Bean oil tanks	5	each holding 120 tons.
Goods sheds	3	4,224 square metres
Total ..		258,687 square metres

OPEN-STORAGE GROUNDS: About 330,000 square metres.

MAXIMUM STORAGE CAPACITY OF WHARF COMPOUND: About 750,000 tons.

Highest storage record, about 600,000 tons.

SHIFTING EQUIPMENTS: Total length of shifting sidings, 45 miles.

Locomotive engines	12
Goods cars (30 tons each)	250
Motor trucks (4 tons each)	4
Trailers (2 tons each) .. .. (accessory to above)	8
Trucks (2 tons each)	6
Tractors..	2
Trailers (1 ton each) .. .. (accessory to above).	10

Carts, wheel-barrows, etc., are also used.

Daily shifting capacity (10 hours) about 20,000 tons.

CARGO WORKERS:

Chinese Coolies.

Average daily workers; about 6,000-8,000.

per capita working capacity; about 5 tons.

Contract suppliers: Fukusho Co. (sole contractor) They have coolies' quarters accommodating about 13,000 coolies.

DRY DOCK: One (under management of Kawasaki Dockyard Co., Ltd., and owned by S. M. R. Co.)

Docking capacity .. .. .. 6,000 tons gross.

Osaka's Road Program

The city of Osaka will soon begin an extensive road building program which will extend over a period of ten years and more than 40 million yen will be spent if the plans as proposed by the Osaka city planning commission are accepted and passed by the home department of the national government.

Under the plans as put forward by the city authorities ten main highways radiating from Osaka will be thoroughly made over. The new highways will be of macadam. This investigation has been going on for the last several months with Mayor Ikegami taking a leading part. He is chairman of the city commission. The plans also state that the new roads will be from 48 to 72-ft. in width, this depending upon the amount of traffic which will have to be accommodated. This program is primarily intended to improve the roads in the outlying districts of the city.

According to their announcement the city is also planning to enter upon another program of approximately the same size in rebuilding the city streets of Osaka. This is dependent upon whether or not the first program is accepted by the government. It is planned to carry out the second program in conjunction with the building of the proposed new railway station for Osaka. If the station is built it will be the largest railway station in Japan.

The following table shows in detail the roads which are to be improved under the first program and the expenditures for each:—

Lines	Approximate length in ken	Expenditures
Denpo-Amagasaki-Osaka ..	1,932	Y.7,159,087
Osaka-Itami	1,921	1,224,604
Osaka-Ikeda	4,519	8,741,588
Fuita-Osaka	4,009	2,083,258
Sumiyoshi-Osaka	1,551	1,254,501
Osaka-Maioka	1,573	2,275,398
Osaka-Nara	2,419	1,324,955
Tennoji-Kuroe-Osaka ..	3,385	2,559,967
National Road No. 2 ..	2,690	2,083,258
National Road No. 16 ..	3,377	5,927,637

New Typewriter Manufacturing Co.

On March 31, 1922, the Toyo Typewriter Kabushiki Kaisha, with a capital of Y.1,000,000, was organized in Tokyo, to manufacture typewriters in Japan to supply the demand for foreign language keyboards. One-fourth of the capital is already paid-up.

Electrical Developments in Japan

1. Diado Electric Power Co., Ltd.

IN February, 1921, the Osaka Soden Kabushiki Kaisha, the Nihon Suiryoku Denki Kabushiki Kaisha and the Kiso Denki Kogyo Kabushiki Kaisha, completed an amalgamation of interests, and organized the Daido Denryoku Kabushiki Kaisha to take over their properties and business, with a capital of Y.100,000,000. To-day, the outstanding paid-up capital of this company is Y.44,320,000. As the amalgamation is composed of three different companies, the paid-up shares issued are of different valuations; one issue of 372,000 shares being paid up to the amount of Y.30.00 on a Y.50.00 face value, another issue of 120,000 shares is paid up to the value of Y.25.00, and the balance of the shares, 1,508,000, are paid up to Y.20.00. At the end of 1921 the company had outstanding Y.10,000,000 of debentures, besides ordinary loans amounting to Y.6,152,728.

The Daido Denryoku K.K. has under construction, or planned for early construction, some eight power plants which will generate 217,000 kilowatts in all. These plants are situated on the Kiso and Yasaku rivers. The entire construction program is to be completed by the end of December, 1925.

A detailed list of the power houses to be built follows:

(1) Kisuhara power house, in the Yasaku River, 6,000 kilowatts, began operations on February 18, 1922.

(2) The Okuwa power house, on the Kiso River, 11,000 kilowatts, will be completed in August this year. The whole generating capacity of this plant is under contract to the Kansai Denki K.K.

(3) Suhara power plant, on the Kiso River, 19,150 kilowatts, is now under construction. When completed this station will transmit its power to Osaka, together with the power generated at the Okuwa station.

When the plan to use the power generated in Stations 2 and 3 is put into operation it will cause a scarcity of power in the Nagoya district. This scarcity will be met by new power houses under construction, and from the Yasaku River plants.

(4) Shizumo power plant, on the Kiso River, 12,600 kilowatts now supplies Nagoya with its whole capacity.

(5) Nishikachihara power plant, on the Kuzuryo River, 7,200 kilowatts, supplies 2,000 kilowatts during the day, and 600 kilowatts at night to the Echizen Denki K.K., the Kyoto Dento K.K. and the Taisho Denki K.K. The balance of the power is used to manufacture caustic soda at the Takeu Factory.

(6) Kema power plant, coal burning. 12,500 kilowatts, now under construction and will be completed this year.

(7) Dokusho power plant, coal burning, 40,000 kilowatts, now under construction.

(8) Oi power plant, coal burning, 30,000, now being planned.

The company also contemplates erecting power plants on the Kiso River at, (1) Momoyama, (2) Ochiai, (3) Kasagi, (4) Nishikitsu and (5) Imawatari. There are also three coal burning plants in contemplation, at Hanabusa, Higashi Kachihara and Shitauchinami.

TRANSMISSION LINES:

(1) Sixteen miles between the Okuwa power plant, and the Nakatsugawa transmission station have been completed.

(2) Between Kiyosu transmission station and the Osaka transformer station, the line is now being erected.

(3) Between the Kiyosu transmission station and the Dokusho power plant, a survey is now being undertaken.

(4) Between the Kiyosu transmission station and the Osaka transformer station preparation is now being made to erect a line for telephone service.

The company now owns completed transmission lines for telephone service, between

(1) Shizumo power plant, and Rokugo transformer station.
(2) Kushihara power plant, and Mizunami transmission station.
3. Kushihara power plant and Mizunama transformer station.
The entire stretch of wires is 97.47 miles, of special high-pressure lines.

TO INSTAL RADIO TELEPHONE SYSTEM:

In addition to the above installations the Daido Electric Power Company is erecting the first radio telephone system in Japan between Osaka and the Kiso district, opening communication for 150 miles. It is to be for the use of the company, although it will be thrown open to the public in due time. Okuwa, in Kiso, on the Central Japan railway line, will be the starting point of the wireless line and a link of wireless communications will be established connecting Nagoya and Osaka.

The application has already been filed, and, as soon as permission has been granted, the work will be commenced. According to the plans and specifications the machine used will be the De Forest system of wireless telegraphy and telephony, form O T 401. The height of the poles will be about 150-ft., the power is 2 kilowatts and 1,800 volts. The starting point in Okuwa-mura, Nagano prefecture, is to be located in the generating station of the company, the receiving station in Nagoya is to be located in the branch office premises in Shichiken-machi, Nagoya city, and in Osaka in the transformation station at Furukawa Bashi, which station will be completed shortly.

While, at present, the distance to be covered is 150 miles, if the result be successful, a receiving station will be established in Tokyo and public service may be commenced in due time.

BUSINESS RESULTS:

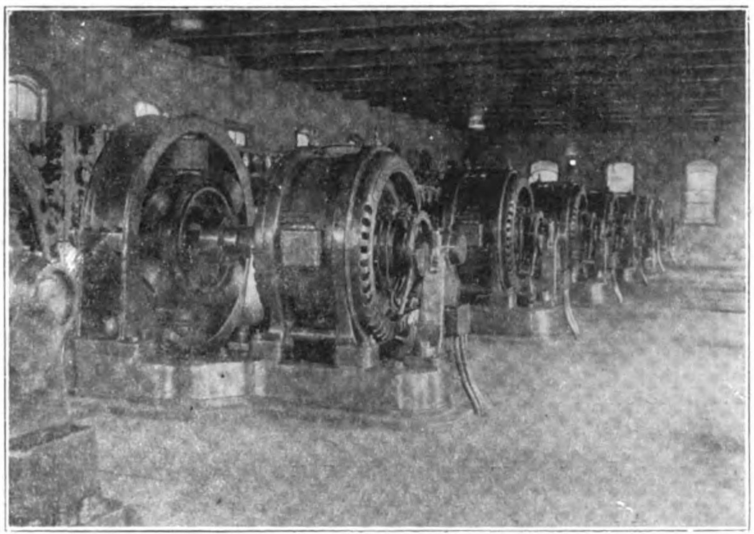
Last year the Daido Denryoku K.K. made profits of Y.856,260, to which was added Y.72,000 surplus carried over from the term before. Out of the total amount of Y.928,000 available to be treated as profits, Y.43,000 was taken for legal reserve, Y.50,000 for bonus for officials and Y.825,250 was paid in dividends at the rate of 6 per cent. per year, and only a little more than Y.10,000 was carried as surplus to the present term of business.

The company's officials report that it is increasing its income this term by some Y.500,000. Income from power sold is estimated at Y.1,616,000 while interest and profits on securities held will yield another Y.200,000. Miscellaneous income is estimated at Y.90,000, making the grand total of income for the present term, about Y.1,906,000. Something like Y.130,000 must be deducted from this amount for costs of operating power plants, Y.70,000 for taxes, and other expenses Y.505,000. The total expense for this term to be about Y.705,000.

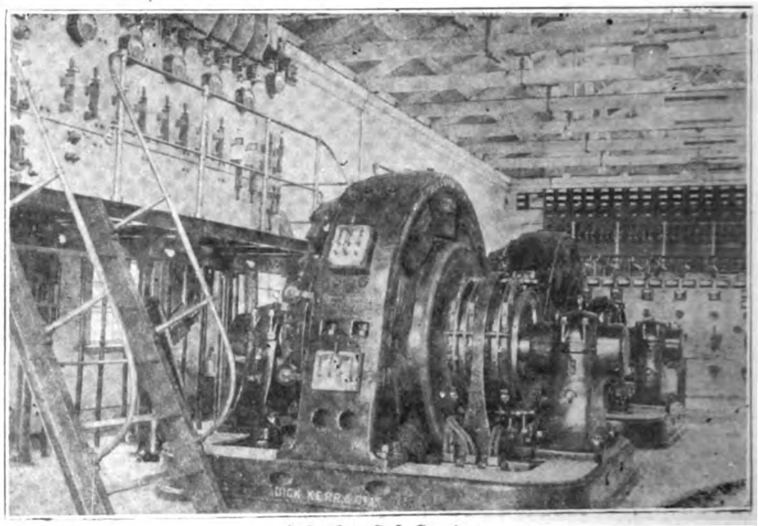
Net profit, therefore, would be something in excess of Y.1,201,000, in addition to the amount carried forward as surplus to this term, Y.10,000. It is proposed to put Y.65,000 to legal reserve, Y.65,000 for bonus to officials and Y.1,046,850, is to be distributed among the shareholders at the rate of 6 per cent. a year. This will leave Y.34,000 surplus to be carried to the next term.

SOME POWER STATIONS OF THE TOKYO ELECTRIC COMPANY

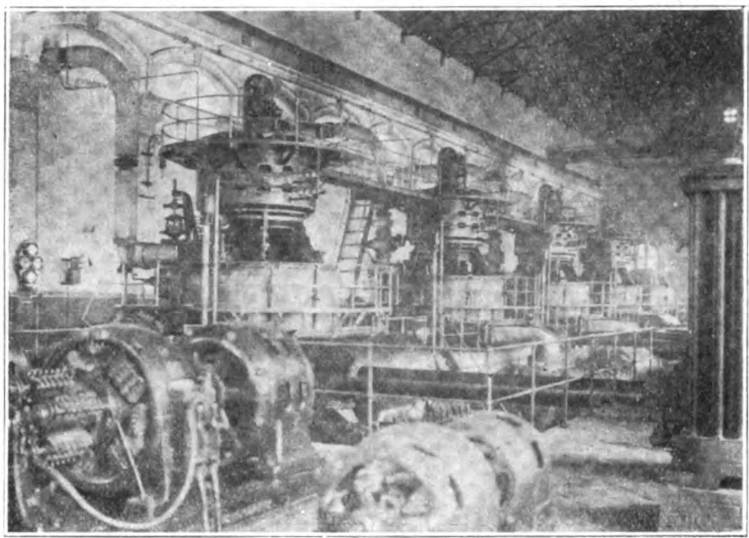
This Company has issued a call on its shareholders for Yen 20,000,000 for new construction



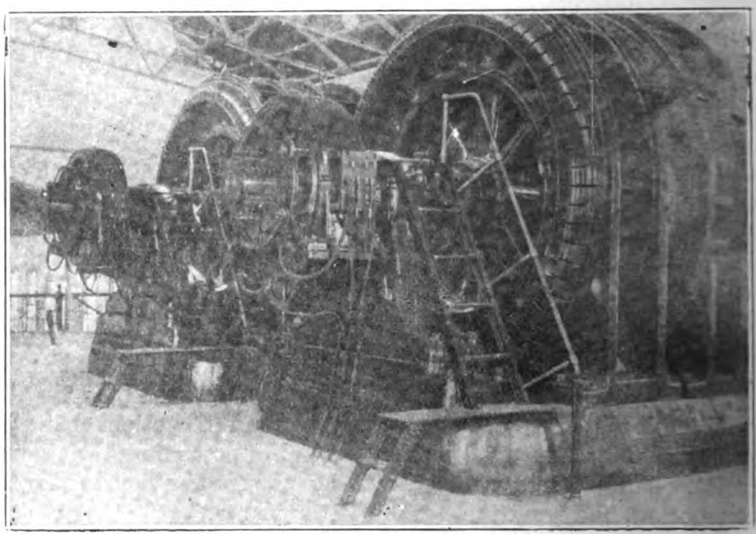
Yokoami Sub-Station



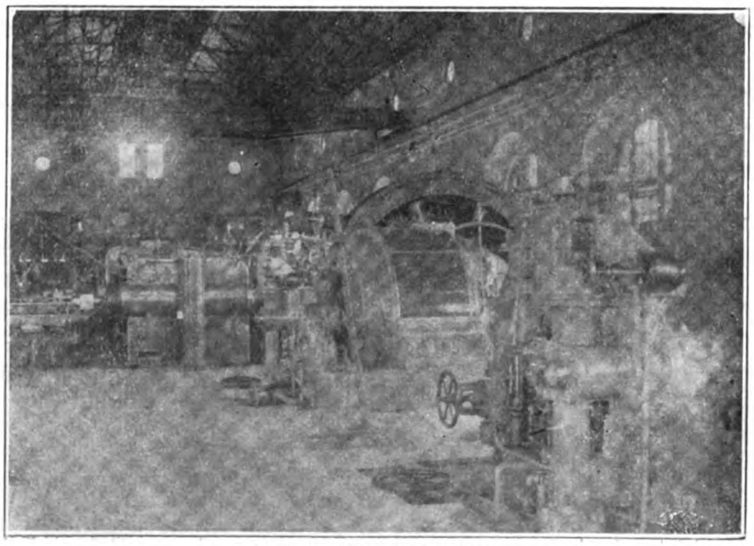
Oshicho Sub-Station



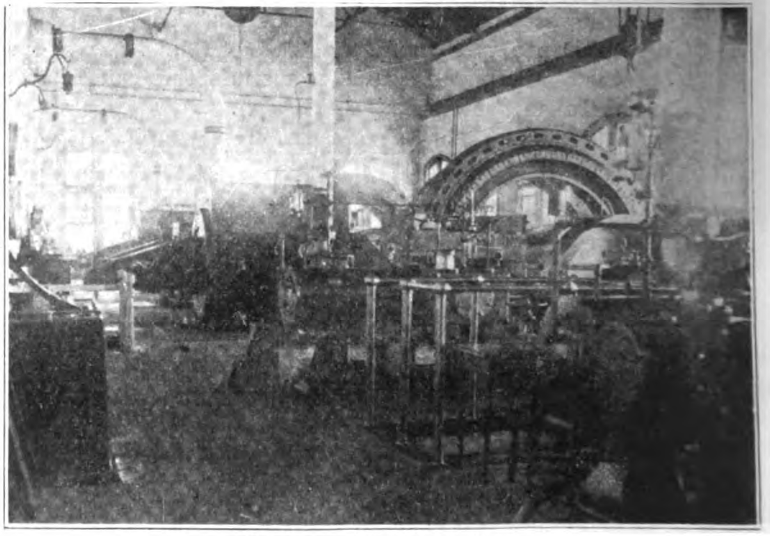
Fukagawa Power Station



Yurakucho Sub-Station



Shibuya Power Station



Shinagawa Power Station

THE FUTURE OF THE COMPANY :

The cost of construction of the company's water power plants is now estimated at Y.572 per kilowatt generated. This compared with other water power companies is very low. But as the company's area of supply is situated as a great distance from the source of power, it is required to erect long transmission lines. This increases the cost of construction per kilowatt generated to Y.750.00 or Y.760.00.

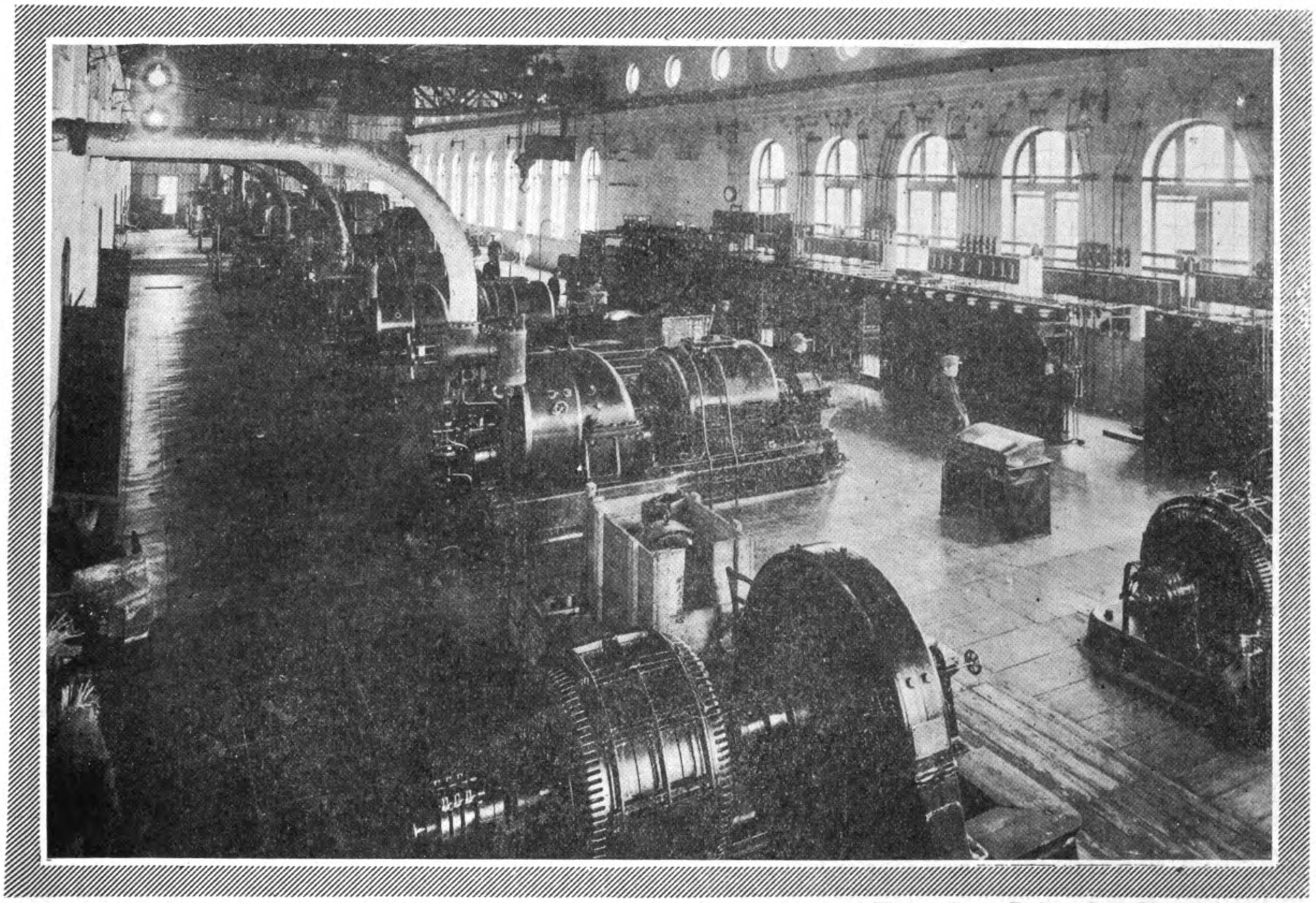
As a matter of fact the company's officials are finding that they do not need such a large amount of money to erect the transmission lines. But the nearer the lines come to Osaka the greater the expense of erection, as the land rental per pole is very high near that city. The annual rent per 36 sq. ft. of land is Y.3 to Y.5 a year. Because of the size of the iron towers erected some five to six times that amount of land is required so that the annual rental per pole is something like Y.20 to Y30. Such an annual charge would inconvenience the finances of any company.

When the Daido Electric Power Co., Ltd., begins transmitting power to Osaka that important industrial centre will be permanently relieved from the constant lack of power which is one of its competitive drawbacks to-day.

Nevertheless the Daido Denryoku has many troubles and hardships to face yet. Since its organization the public has looked on this company with a great deal of doubt. Accordingly the responsibilities of its directors are by no means slight. The success of the company is greatly to be desired because it plans important assistance to the development of Japanese manufacturing industries through its intention to supply Osaka with power.

2. Tokyo Electric Light Company

The Tokyo Electric Light Co. (Tokyo Dento K.K.) intends to call up Y.5.00 on each of its first issue new shares, and Y.7.50 on each of its second issue new, third issue new and fourth issue new shares, before the end of June, 1922. The total sum which this call will yield is estimated at a little more than Y.20,000,000.



Generating Room of the Kyushu Electric Light and Traction Company, equipped with General Electric Steam Turbine Sets: This company proposes to increase its capital Yen 37,400,000, a large proportion of which will be expended in new construction

However all this may be, the fact of the matter is that this company with its capital of Y.100,000,000 is the largest among Japan's water power companies. It is the expectation of the promoters of this company that it will eventually divide the exploitation of Japan's water power with the Nihon Denryoku K.K.

There are twenty company directors, and nine auditors. Mr. Momosuke Fukuzawa the most important figure in Japan's electric power industry is the president of the company, and Mr. Jiro Masuda is the vice-president, while such extremely capable business men as Mr. Koki Ota, Mr. Seiryo Yamane, Mr. Shigeru Kondo and Mr. Ju Sekiguchi, are all members of the board of directors.

The company intends to use the money in the following construction works:—

(1) Constructing transmission lines and transformer stations of the Shin-yetsu Denryoku K.K.

(2) Constructing the third power station on the Fuefuki river, to be completed this year.

(3) In completing the Komatsu power station, this year.

(4) To complete payments to the Keihin Denryoku K.K. (Keihin Electric Power Co.) with which the Tokyo Dento has some contracts in regard to investment.

The transmission lines of the Sin-yetsu Denryoku alone will require from Y.12,000,000 to Y.13,000,000 of this capital increase. It is accordingly confidently believed in electric circles that this company will be obliged to make another call on its unpaid capital after this call has been paid in.

3. Kyushu Electric Light Company

The Kyushu Denki K.K. in order to pay outstanding debts of Y.3,000,000 to the Mitsui interests, and Y.1,200,000 in company debentures, will call up the balance of its unpaid capital on June 1, 1922. The call will be for Y.12.50 a share, and will bring in Y.4,900,000.

It is reported that the company needs from Y.4,500,000 to Y.5,000,000 to complete its hydro-electric power stations at Oyama, Imahata and Chinda, in Kyushu, and also to put the coal power station at Fukuoka, with an estimated capacity of 10,000 kilowatts, into operation.

Other plans of this company are to erect power stations along the Oita River, the Kuma River and the Chikugo River, all in Kyushu. It also intends to make a large investment in the shares of the Kyushu Soden K.K. (Kyushu General Electric Co., Ltd.), when it is eventually organized. A large sum of money is accordingly needed by this company in the near future. To meet these needs it is reported that its present capital will be increased from Y.37,400,000 to Y.74,800,000, shortly after the final payment of the old capital is satisfactorily accomplished.

4. The Gunma Electric Light Company

The Gunma (prefecture) Denki K.K., was established in July, 1919, and it was the intention of the promoters to complete the first part of the power works before the end of 1921. But the bad weather delayed operations at one time to such an extent that the works were more than six months behind schedule. Now it is reported that they will be completed before the end of this half year, June 30, and that for at least five months in the second half year the company will be able to operate its power station at Kanai.

The Kamai hydro-electric power plant is connected by a high-pressure transmission line between Kanai, and Kawasaki, in Kanagawa prefecture, which is 85 miles long. This power station is built to generate 10,800 kilowatts at ordinary stages of water, and 7,800 kilowatts when it is at its lowest stage.

Trials of the company's equipment will be begun in June, 1922.

This company has a contract with the Keihin Dentetsu K.K. (Yokohama-Tokyo Electric Ry. Co., Ltd.,) for the supply of 6,000 kilowatts from the Kanai power station. The balance of the power generated will be sold in small amounts throughout Kanagawa prefecture in the districts between Kanai and Kawasaki.

Estimating the charge for power at 3 sen a kilowatt which is the minimum charge in the Kwanto (Eastern Japan) district, at the lowest stage of water this company's income should be about Y.455,000 for the five months of complete operation next half year. If the estimate is made at the highest stage of water, income should reach Y.550,000. Estimating expenses of operation at 20 per cent. of income, profits should amount to Y.430,000 or Y.440,000. This would be a profit rate of fourteen per cent., but it is reported that the company will confine dividends to 8 per cent. for the time being.

5. Inawashiro Hydro-Electric Company

At a general meeting of its shareholders held in Tokyo on the twenty-eighth of April, the Inawashiro Hydro-Electric Power Company, one of Japan's most important electric enterprises, decided to increase its capital from Y.21,000,000 to Y.50,000,000.

The capital increase will be effected in the following manners :—

(1) The present capital of Y.21,000,000, will first be paid-up in full by calling for a seventh and last payment of Y.10.00 a share on all shares issued.
New shares to the number of 580,000 will be issued, to the face value of Y.29,000,000, each share being Y.50.00 par.

(2) Of this total, 525,000 shares will be parcelled out among the present shareholders, before November 1, 1922, but it is desired to keep the distribution put off until the last moment legally permitted. One and a quarter shares of new stock will be allotted to each share of old stock.

(3) The balance of 55,000 shares will be distributed among the members of the company's office staff and other employees, and other persons who have rendered services to the company worthy of such recognition.

The purpose for increase of capital is found in the company's amended plans for completing the following projects, now under way, or soon to be begun.

	New Plan	Old Plan
(1) Deepening Lake Hinokibara ..	Y. 957,000	Y. 470,000
(2) Increasing equipment at No. 3 Power Station	5,448,000	5,010,000
(3) Increasing equipment at No. 4 Power Station	8,429,000	2,620,000
(4) Deepening Lake Inawashiro ..	4,028,000	3,750,000
(5) Equipment, etc., at Tabata transformer Station	1,780,000	1,640,000
(6) High-pressure transmission lines ..	6,560,000	8,330,000
(7) Completing Odera business office ..	448,000	—
(8) Reserve	1,350,000	2,180,000
Total	Y.29,000,000	Y.24,000,000

Sprinklers in Sakhalin

It may be remembered that, on the conclusion of the Russo-Japanese war, the southern part of the Island of Sakhalin was ceded to Japan. Previously the whole of it had belonged to Russia, and was used by that country as their great convict station, and readers of Charles H. Hawe's fascinating book "In the Uttermost East" will remember his vivid description of the horrors of life in that far-off settlement.

Since taking possession of the southern portion of the island, the enterprising Japanese have developed there the manufacture of wood pulp, and the illustration on this page shows the main street of a village on its west coast in which one of these factories is situated. In the foreground to the right is Mr. John Birtles, the English engineer, who is superintending the erection of the Grinnell automatic sprinkler installation in the pulp mill, together with two Japanese gentlemen connected with the same undertaking.

The photograph, which was taken on November 1st, 1921, gives some idea of the severity of the climate even in earliest winter.

Irrigation Development in Siam

IN the beginning of the year 1913, the preceding rice harvest having been a very bad one, the question of irrigation, for some years in abeyance, began once more to occupy the attention of the government. As a result of investigations into the matter extending over many months, the minister of agriculture submitted a note to the king strongly advocating the undertaking of a scheme of irrigation in the Menam valley. In this note it was suggested that a foreign irrigation expert of reputation be engaged to report on the situation and, if his report should prove satisfactory, to initiate work. Shortly afterwards, the minister of agriculture took measures to secure the services of an irrigation expert of wide recognized experience, which measures resulted in the loan of the services of Mr., now Sir Thomas, Ward, C.I.E., M.V.O., by the government of India.

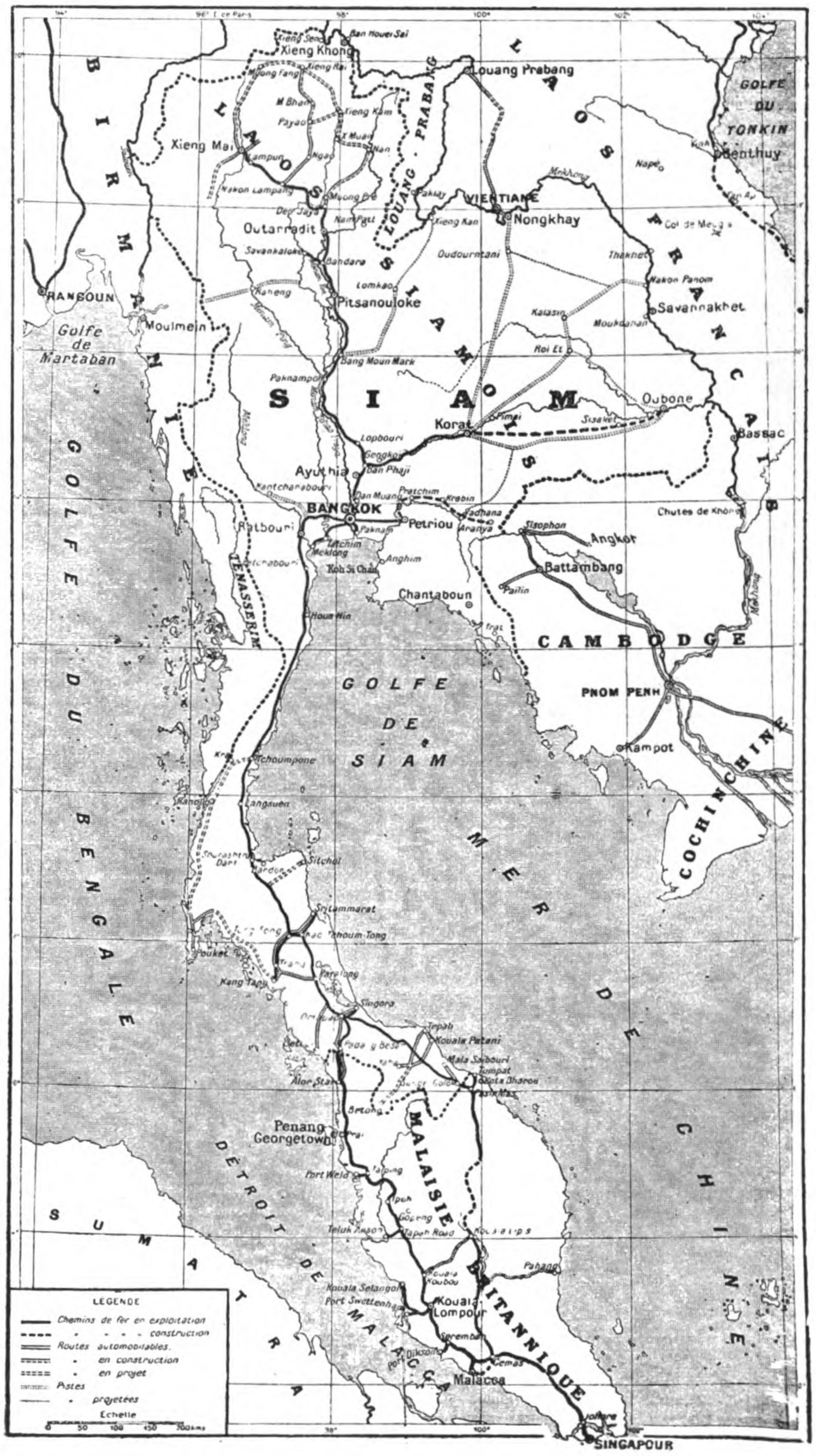
Sir Thomas Ward arrived in September, 1912, with selected assistants, and immediately began to investigate, the plans and estimates formerly compiled in the irrigation department being placed at his disposal. An office was established and a staff of officers was collected and before long parties of surveyors and levellers were out in all directions verifying the old plans and compiling new. Sir Thomas himself traveled extensively, and by actual observation and with the help of his assistants soon acquired an intimate knowledge of the country and the conditions affecting irrigation.

By about August, 1915, the whole question had been worked up very exhaustively and with the assistance of various departments of government, notably the war department (krom penti) and the Mahatai, many maps had been prepared and a mass of statistics regarding population, crops, rainfall and revenue had been collected and assimilated. Sir Thomas Ward then began to draw up a report and projects, but meanwhile steps were taken to form an irrigation department in preparation for the moment when actual construction should begin. Mr. R. C. R. Wilson, of the Punjab irrigation service who accompanied Sir Thomas Ward to Siam, was appointed director, and an officer was engaged in India for the position of deputy director. Arrangements were made to fill other appointments of the department from the staff which had been working on the projects.

Sir Thomas Ward delimited six different areas which could be irrigated (each by means of its own self-contained system of canals) by the three rivers of central Siam and by each of the three distributaries of the Menam Chao Phaya; and he found and fixed the boundaries of a central part that extends from Ayuthia to the sea, too flat for irrigation except to a limited extent but which could be developed by the further construction of navigation and drainage works similar to those which had already been constructed by the irrigation department. He prepared preliminary projects explaining the relative merits of each of these integral parts and set forth the work to be done to obtain the ultimate full development of the country on the most modern and up-to-date lines. In doing this Sir Thomas explained that the attainment of such full development must occupy a long period of years and entail a total expenditure of something like 150 millions of badh and would moreover become necessary only after Siam should have acquired a population sufficiently numerous to occupy all the land thus made available.

Sir Thomas Ward advocated, to meet immediate needs, the execution of a selection of his separate projects, giving preference to those which seemed of most importance, at a total cost of some 22 or 23 million badh; that being about the sum which Sir Thomas was given to understand that the government desired to spend to attain the object that they had in view, viz., to enable Siam to maintain, against the increasing competition of neighboring rice-growing states, the position hitherto held by her in the markets of the world. Sir Thomas estimated that such a sum would provide for the immediate expansion necessitated by the ever increasing energies of the people consequent on the just and stable rule that they now enjoy.

After careful consideration of the immediate needs of the different tracts of country from the point of their irrigation potential-

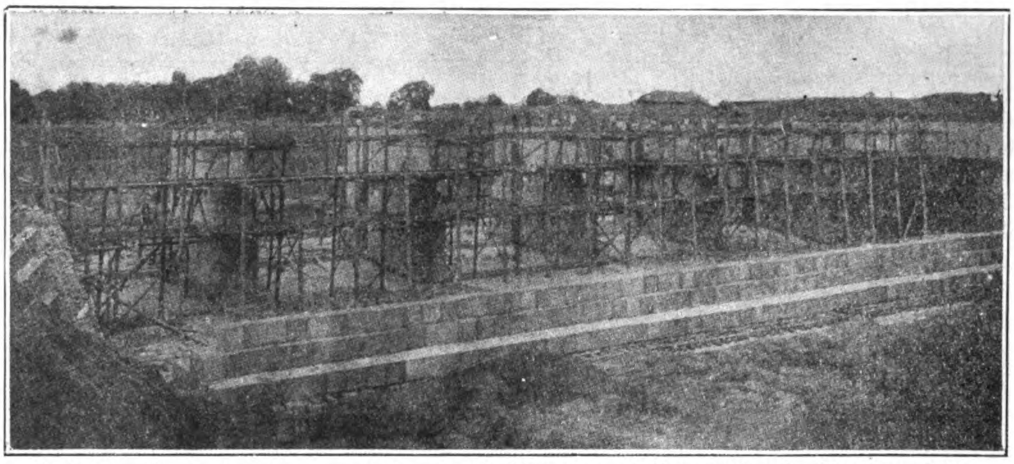


ities, and of the views held by the statesmen of Siam, Sir Thomas Ward advised the immediate sanction of the following projects :—

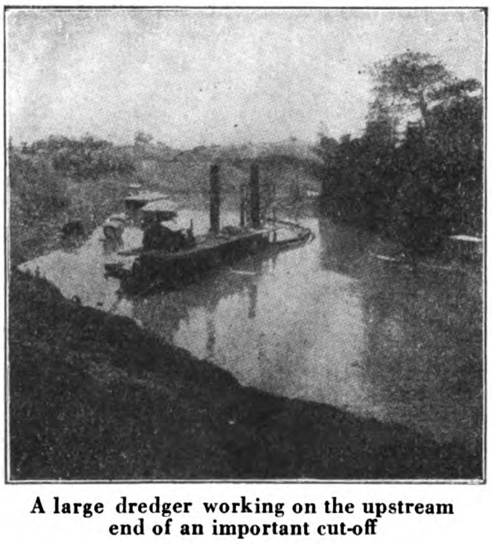
		Ticals.
(1)	The Subharn canal	7,500,000
(2)	The Bhejaburi east canal	1,500,000
(3)	The Prasak south canal	11,500,000
(4)	Hill irrigation (Circle Bhayabh)	1,500,000
(5)	Navigation and drainage work in the flat plain from Ayuthia to the sea on both banks of the Menam	1,250,000
	Grand Total ..	22,750,000

The following are points of interest concerning these various projects :—

No. 1. *The Subharn Canal.*—Sir Thomas Ward found from the records of the river gauge maintained at Wat Dahad on the Menam near Jainadh since the year 1904, that the water levels obtaining annually between the months of July and December would suffice for the irrigation of certain areas of land, if canals were opened up along the Subharn, the Menam Noi and the Lopburi off-shoots from the main Menam Chao Phya river. He also found that the lands along the last of these off-shoots were already in a prosperous condition and might safely be left alone until the others had been brought to an equal condition. It was chiefly for the improvement of the lands watered by these three off-shoots that the scheme of a great barrage at Jainadh had been suggested by a former irrigation expert. Sir Thomas Ward considered that such barrage, though doubtless a work of much potential value, might be left over for a time, and thought that it would suffice for the immediate needs of the country to spend 7,500,000 each on a complete system of scientifically constructed canals leading from the Subharn river, thoroughly carried out to the last detail of the field embankments and ditches. The cost of this last item, it should be noticed in passing, would be paid by the landholders but the construction would be carried out for them by the government engineers at an estimated outlay of about one tical a *rai* owned. It was an integral part of Sir Thomas Ward's scheme that this cost of embankments and ditches should be lent by the state to the landholders on suitable terms, to safeguard the community from the load of debt which has so frequently overwhelmed badly throughout irrigation enterprises, where the state, from want of experience, has not assisted the farmers in the right way at the right time.



Irrigation development is progressing in the Kingdom of Siam under the direction of the Royal Irrigation Department. This photograph shows the construction of a large barrage in connection with this development



A large dredger working on the upstream end of an important cut-off

No. 2. The Bhejaburi river, if provided with a barrage at Wad Dhagoi, could feed canals on either bank so as to ensure the rice crop against breaks in the rains. The barrage at the abovementioned spot and a canal for the tract lying between the river and the sea, would ensure a good measure of prosperity for the people of the district. If at a later date, further demand should arise, canals on the other side of the river, that is between the river and the hills could also be carried out.

No. 3. The works on the Prasak river were designed to complete the Glohng Rangsit system of canals, the lease of which lapsed to government in April, 1914. It appeared to be necessary to make this tract as prosperous as possible so that there might be no undue emigration of tenants to the Subharn, after the development of that district. Sir Thomas Ward urged that it was all important that what might be done in the inauguration of irrigation should be complete and thorough, so that the farmers all over Siam should realize the advantage to agriculture of modern scientific work.

No. 4. Though Sir Thomas Ward was not directly concerned with questions of irrigation beyond the limits of the great central plain, circumstances brought the agricultural condition of the Bhayabh circle to his notice, and one of his officers, Mr. Freeman, while in the Krom Tang, examined the country and drew up a scheme for improving the rice-growing conditions of Nagorn Lampang. Sir Thomas Ward considered that the general scheme of Siamese irrigation should embrace the Bhayabh circle so that the harmonious development of rice-growing in the different parts of the kingdom could be secured, to the end that all might share alike in the benefits of the stable government it is the good fortune of the people to enjoy. Sir Thomas Ward recommended that the scheme for Lampang be sanctioned as soon as possible and that an officer should be sent to get out detail plans and estimates and at the same time work out preliminary projects for the other valleys of Bhayabh on the same lines as he was doing for the plains of Siam.

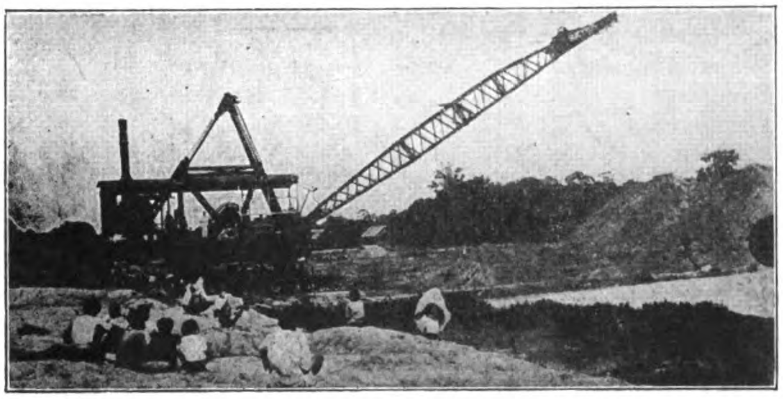
No. 5. Sir Thomas Ward considered that the further development of the navigation and drainage canals and flood control works, in the low, flat part of the central plains should be continued on much the same lines as those followed during the ten years preceding his deputation to Siam. He thought that 1,250,000 badh would be a suitable sum to ear-mark for expenditure on such works during the six or eight years it would take to construct the projects for which he was advising sanction.

Prasak Canal Project

Of the several projects drawn up the government decided, for various reasons, that the Prasak south canal scheme should precede the Subharn canal scheme, and preliminary work was begun at the end of 1914; actual construction work being started in November, 1915, when the necessary excavating machinery had arrived from the United States of America and had been erected.

The site for the headworks of the canal, as finally selected, is at Dha Luang, about 6 kilometres in a direct line from Dha Rua station on the northern railway. The original site proposed for the headworks was at Saraburi, but if they had been built

there, the Prasak canal would have depended for all time solely on the Prasak river for its supply, and in the event of the Menam Chao Phaya ever being tapped by means of a weir at Jainadh or thereabouts, the Prasak canal system could not have benefitted thereby. With the headworks built at Dha Luang, the Prasak canal will become an important link in any big general system of irrigation from the main river that may be constructed in the future, as well as being properly situated to absorb the whole of the water available from the Prasak river.



One of three Class 175, B. Bucyrus Dragline Excavators working on the Siamese Government Irrigation System

The headworks consist of a barrage across the Prasak river, the head regulator of the canal, and two locks, one for through river traffic and the other for traffic between the river and the canal.

The barrage consists of 6 spans of 12.5 metres each, and is provided with single-lift steel gates worked on the Stoney principle of free rollers. These gates are probably the highest single-lift gates ever constructed on this principle. The piers and abutments are 12.0 metres above river bed, surmounted by steel towers and an overhead operating bridge, the total height from river bed to the platform of the bridge being 20.10 metres. The barrage is founded entirely on clay and, in order to attain an even intensity of pressure within safe limits over the whole bed when working under full load, the foundations have been constructed as a solid slab of concrete reinforced with steel rails pinned into the river bed by solid concrete extensions under the piers. The piers and abutments as well as all works at Dha Luang are constructed of random rubble masonry, worked up in courses, and in order to obtain a good through bond, concrete slabs reinforced longitudinally and transversely have been added at intervals. Cement mortar, with cement from the Siam Cement Company's works, has been used throughout and the stone used is a tough durable limestone that has been quarried by the irrigation department at their own quarries at Pak Prio.

The contract for the steel-work and the gates for the barrage was placed with Messrs. Glenfield and Kennedy, of Kilmarnock, Scotland. The head regulator of the canal consists of 8 spans of 4.2 metres each, provided with gates to work on the Stoney principle as adopted for the barrage. These gates were built by the department at their own workshops in Bangkok. The total cost of the headworks will amount approximately to Tcs. 2,300,000, being Tcs. 1,000,000 in excess of the original estimate, which was framed entirely on a pre-war basis.

The Main Prasak canal runs in a south-easterly direction to Nong Ge, a distance of 32 kilometres, where it bifurcates into two branches both connecting with the existing Rangsit system ; the western branch joins Ghlong Hok Wah Sai Bon, and the southern branch Ghlong 13. The main canal at its head has a bed width of 40 metres and a depth of 3 metres. The designed slope is 1 in 13,500 and its discharge 100 cubic metres per second. Provision has been made for the crossing of four large drainages carrying about 120 cubic metres per second, and the works for these have been so constructed that their supply may be absorbed into the canal for irrigation purposes, or passed under the canal when not required. The main canal and branches are provided with locks and will afford a better waterway for traffic to the capital from the Prasak river, and also from that river to the Prachim side, than at present exists. In addition, provision is being made for the transfer of traffic from the canal to the northern railway at Nong quay where the Korat line crosses the main canal by means of a reinforced concrete bridge.

Distributing channels take off from the main canal and the two branch canals, and from these again minor channels and water courses deliver the water on to the individual cultivator's fields. The main canal, the western branch canal and the system of distributing channels connected with these are nearing completion, and actual irrigation from then will commence for the rice crop of 1921.

The area to be protected annually by direct irrigation is estimated at 100,000 hectares, or 625,000 rai. Furthermore by linking up the new system with the old communication canals and creeks to the southward of Ghlong Hok Wah Sai Lang and utilizing the surplus water of the Menam Nakonayok, a copious flow of fresh water will be provided for the great and fertile, though low-lying plain, bounded by the Rangsit area on the north, the Menam Chao Phya on the east and the sea on the south. This water which will replace the noxious saline fluid, inimical to plant and animal life, that now stands in the canals and creeks of this area for a great part of each year, will supply irrigation of the kind known as indirect, or flood irrigation, consisting of the alternate flooding and draining of the land by one and the same set of channels according as desired. Thus in addition to the area directly affected, a very large tract will be indirectly benefitted by the system. It is to be noted that to obtain the best results in rice cultivation an efficient drainage system is practically as important as the supply of water.

The revised estimate for the Prasak project at present stands at Tcs. 13,300,000 and the expenditure up to March 31st, 1919 is as follows :

2458 B. E. (1915-16)	.. .. Ticals.	388,402*
2459 B. E. (1916-17)	.. .. ,,	1,273,559
2460 B. E. (1917-18)	.. .. ,,	1,664,015
2461 B. E. (1918-19)	.. .. ,,	2,655,382
2462 B. E. (1919-20)	.. .. ,,	2,495,812
2463 B. E. (1920-21)	.. .. ,,	3,884,289
Total	.. ,,	12,361,459

*Includes expenditure on other projects Tcs. 238,815.24

Of the above sum Tcs. 2,000,000 has been expended on machinery, stores and plant which will be available for use on other projects if sanctioned.

Kawasaki Estimating on Sydney Bridge

The Kawasaki Dock Yard Company of Kobe some time ago received an invitation from the government of New South Wales, Australia, for an estimate on a bridge to span a gulf of the Sydney Bay which bridge is expected to be one of the longest bridges in the world. The bridge is to be 1 mile long, 100-ft. wide, with four broad-gauge car tracks, one automobile road, and two roads for pedestrians. Any of the largest battleships afloat in the world will be able to pass beneath the bridge.

Workshops of the N.E.I. Railways

CHIEFLY for the up-keep of the rolling stock, consisting in 1919 of more than 500 locomotives, 1,600 carriages and 11,000 cars and also for the repairs necessary to keep the other railway works in good order and also for the construction of new lines, the service of the state railroads-and tramways possesses in Java six workshops, viz., three main workshops at Manggarai, at Bandoeng and at Madioen and three auxiliary workshops at Poerworedjo, at Sourabaya-Goebeng and at Djember.

The short enumeration proves clearly that the range of work done in these workshops and especially that by the main workshops is more manysided and intricate than generally is the case in Europe for such establishments. Assistance from the private industry is almost wholly excluded; on the contrary, often assistance has to be given to private persons or companies and also to other government's services. Every part of the work has to be executed by the workshops themselves, consequently the extent of the forges and the foundries forms a striking feature.

The situation of these workshops at nearly equal distances along the mainline, which has developed chiefly in a longitudinal direction, may in general be considered a very good one; for instance the workshops at Manggarai and at Sourabaya-Goebeng, which are situated near the two largest harbors on Java's northcoast, viz., Tandjong-Priok and Sourabaya, also those of Poerworedjo near the growing port of Tjilatjap on Java's southcoast, are favorably situated with regard to the accumulation of rolling stock in the neighborhood of these harbors, whereby the transport of defective rolling stock has been reduced to a minimum. The work shops at Bandoeng, situated in the midst of its plateau, have chiefly to repair the heavy mountain-locomotive, running on the Preanger lines and of the other rolling stock, used on this plateau, which stock has therefore not to be transported for repairs over the mountain-lines of the railway with their limited traffic capacity. The workshops at Djember situated in the centre of Eastern Java has to keep in good order the stock, used in these more remote parts of the country.

The mainwork shops at Madioen are less favorable situated.

It stands to reason that the capacity of the workshops had to keep pace with the very rapid increase of the rolling stock; consequently during the period from 1912 till now.

(1) A quite new workshop for cars and carriages was built at Sourabaya-Goebeng instead of the old one at Sourabaya-kotta, which could not be enlarged.

(2) The workshop at Madioen was enlarged and modernised, but in such a way and on such a scale that it might be considered as a newly built one.

(3) Quite new, modern mainwork shops were built at Manggarai as a substitute for the old ones of the N. I. S. at Boekit Doeri (Meester-Cornelis), which also could not be enlarged.

(4) The other workshops—especially those at Poerworedjo—were more or less extensively enlarged with regard to buildings as well as to equipment.

Next some figures may be mentioned to give an idea of the working range of the shops.

On the first of January, 1919, there were employed in the different workshops. :—

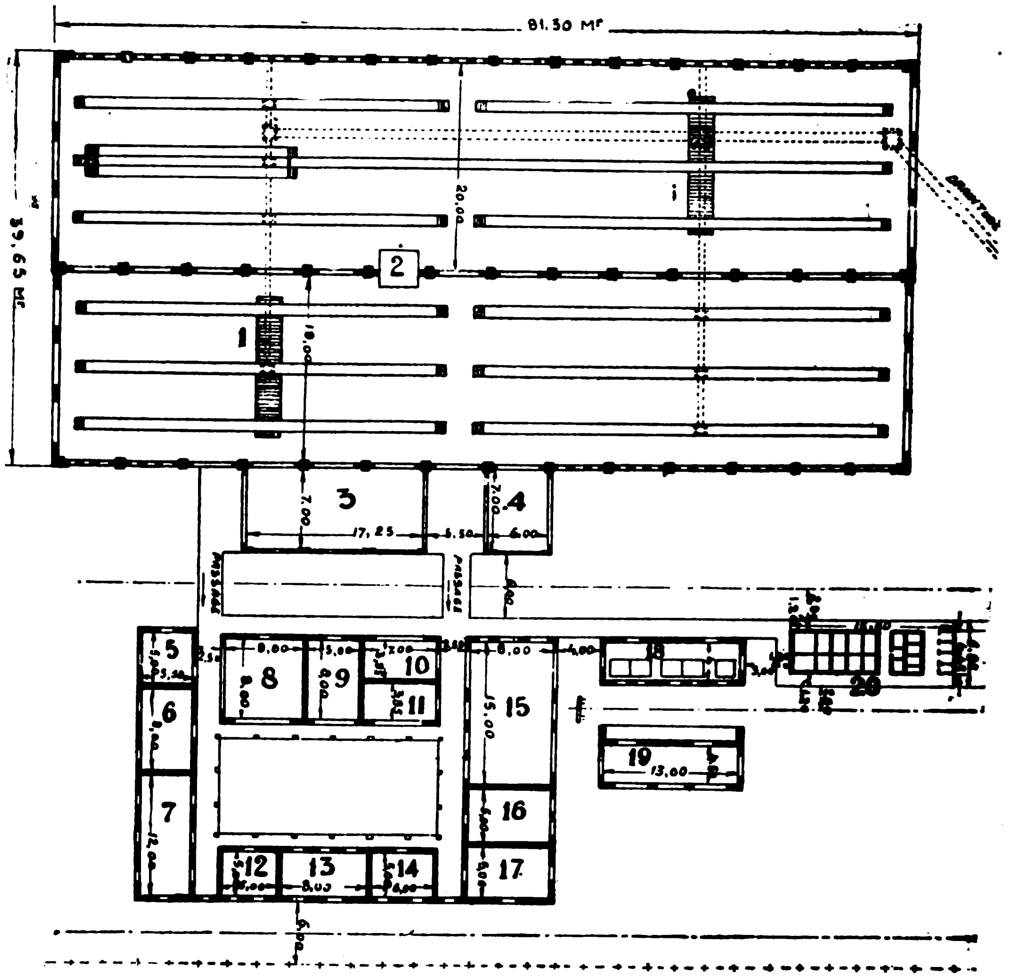
	Laborers	Apprentices	Coolies
Manggarai	652*	125	86
(for the greater part still in erecting stage)			
Bandoeng	1,009	73	245
Poerworedjo	390	40	20
Madioen	1,332	176	144
Sourabaya-Goebeng	892	100	100
Djember	444	70	74
Total ..	4,719	584	669

or in total 5,972 men, supervised by one chief engineer, 7 engineers, 9 mechanical inspectors, 26 foremen, 32 overseers, 13 apprentices and 40 shift-foremen.

During the year 1918 there has been paid on wages and salaries *f* 1.285, 628, 37 and *f* 484, 705, 71 respectively.

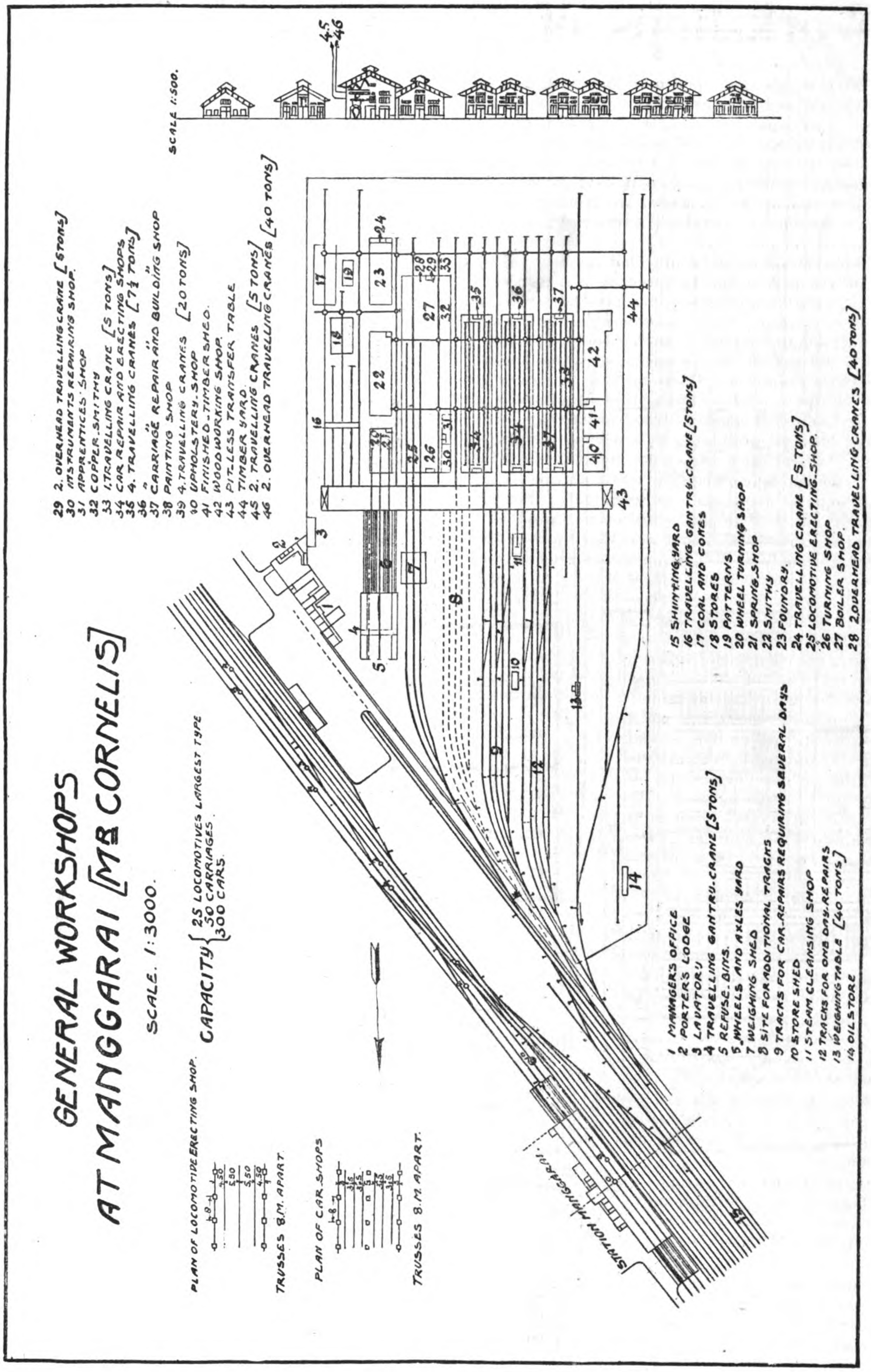
The motive power of the workshops is partly electrical and partly derived from steam-engines.

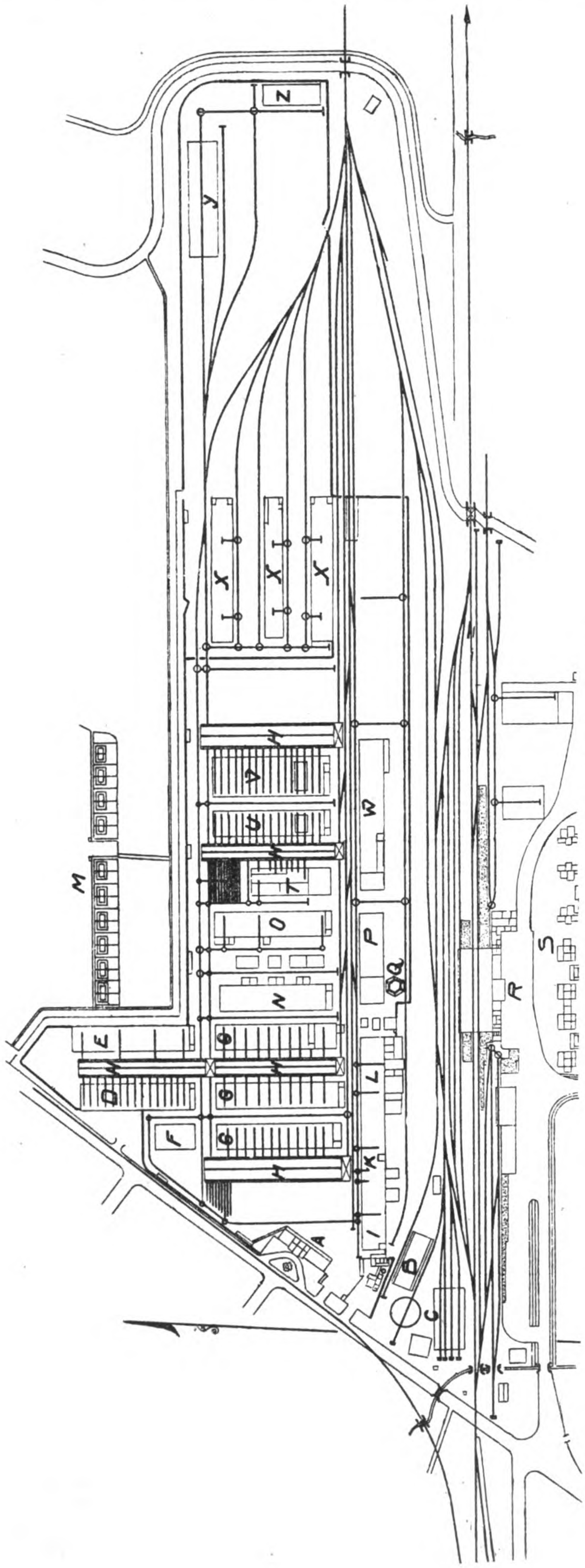
* This number will be more than doubled when the erecting of the workshop delayed by the war, is wholly finished.



LOCOMOTIVE SHED AT MEESTER CORNELIS

1 Transverse Axle Pit
2 Foreman's Office
3 Electric Equipments' Repair Shop
4 Smithy
5 Foreman's Office
6 Assistants' Office
7 Office
8 Store for Finished Parts
9 do.
10 Night Firemen's Tools
11 Cloak Room
12 European Employee's
13 Lecture Room
14 European Employee's
15 Store for Unfinished Parts
16 Native Drivers
17 Native Firemen
18 Oil Tank Room
19 Oil Drumstore
20 Bathrooms and W.C.'s


GENERAL WORKSHOPS
AT MANGGARAI [MR CORNELIS]
SCALE. 1:3000.
PLAN OF LOCOMOTIVE ERECTING SHOP.
TRUSSES 8.M. APART.
PLAN OF CAR SHOPS
TRUSSES 8.M. APART.
CAPACITY { 25 LOCOMOTIVES LARGEST TYPE
50 CARRIAGES
300 CARS.
STATION MANGGARAI.
SCALE 1:500.
1 MANAGER'S OFFICE
2 PORTER'S LODGE
3 LAVATORY
4 TRAVELLING GANTRY-CRANE [5 TONS]
5 REFUSE. BINS.
5 WHEELS AND AXLES YARD
7 WEIGHING SHED
8 SITE FOR ADDITIONAL TRACKS
9 TRACKS FOR CAR-REPAIRS REQUIRING SEVERAL DAYS
10 STORE SHED
11 STEAM CLEANSING SHOP
12 TRACKS FOR ONE DAY-REPAIRS
13 WEIGHINGTABLE [40 TONS]
14 OIL STORE
15 SHUNTING YARD
16 TRAVELLING GANTRY-CRANE [5 TONS]
17 COAL AND CORES
18 STORES
19 PATTERNS
20 WHEEL TURNING SHOP
21 SPRING SHOP
22 SMITHY
23 FOUNDRY.
24 TRAVELLING CRANE [5 TONS]
25 LOCOMOTIVE ERECTING SHOP.
26 TURNING SHOP
27 BOILER SHOP.
28 2 OVERHEAD TRAVELLING CRANES [40 TONS]
29 2. OVERHEAD TRAVELLING CRANE [5 TONS]
30 INSTRUMENTS REPAIRING SHOP.
31 APPRENTICES' SHOP
32 COPPER SMITHY
33 1 TRAVELLING CRANE [5 TONS]
34 CAR REPAIR AND ERECTING SHOPS
35 4. TRAVELLING CRANES [7½ TONS]
36 " " "
37 CARRIAGE REPAIR AND BUILDING SHOP
38 PAINTING SHOP
39 4. TRAVELLING CRANES [20 TONS]
40 UPHOLSTERY. SHOP
41 FINISHED. TIMBER SHED.
42 WOODWORKING SHOP.
43 PIT-LESS TRANSFER TABLE
44 TIMBER YARD.
45 2. TRAVELLING CRANES [5 TONS]
46 2. OVERHEAD TRAVELLING CRANES [40 TONS]



GENERAL WORKSHOP AT MADIOEN

A. Head office
B. Coal shed
C. Locomotive shed
D. Tender shop
E. Boiler shop
F. Coppersmithy

G. Locomotive repair shops
H. Transverse tables
I. Small fittings' shop
K. Turning shop
L. Larger fittings' shop
M. Native workmen's compound

N. Foundry
O. Smithy
P. Finished timber shed
Q. Water tower
R. Station building
S. Officer's hou-es

T. Wheel and tire shop
U. Car repair shop
V. Carriage repairing and building shop
W. Woodworking machinery and carpenters' shop

X. Stores
Y. Coal shed
Z. Tar, oil and inflammable matter

Electric power is used in the workshops at Manggarai, Bandoeng, Madioen and Sourabaya-Goebeng.

In this connection it may be observed that Madioen and later on Manggarai also, receive the necessary current from governmental central stations, whilst the two other workshops are connected to local electric power plants.

The kind of current, however, is the same in all the workshops, viz., three-phase current of 220 volts at 50 periods per second.

A reserve of calorie energy is to be found in the workshops at Bandoeng and Madioen, as to that at Manggarai and Sourabaya-Goebeng, the reserve power is provided for by the local central station.

All the workshops with exception of the new one at Manggarai, are built on the transversal system with tracks (traverse to the main ones) for the locomotives, carriages or cars placed in several buildings, whilst their transportation is effected by means of transfer tables between those buildings, e.g., as shown in the plan of the workshops at Madioen.

The workshop at Manggarai is built according to the longitudinal system, whereby the rolling stock is put on in groups of three tracks, the middle one serving for circulation.

These tracks are placed longitudinally in the buildings. The transposition is effected by means of highly elevated traveling-cranes.

In connection with this it ought to be mentioned that the distances between the tracks and the height of the locomotive erecting shop are dimensioned in such a manner, that, when during busy times the middle tracks are also filled up with locomotives to be erected, revised or repaired, every engine may be lifted and transported clear over the other ones. This requirement necessitates a great height of the building but at the same time it allows the application of light erecting cranes traveling under the heavy transfer-cranes.

With the longitudinal system it is evident that similar cranes are used for lifting cars and carriages, which with the transversal system is effected by means of either cranes or gantry cranes c. q. jackscrews and carriage jacks.

For the new following short survey of the arrangement and methods of the workshops these at Manggarai and at Madioen are taken as examples, because in these both systems have found an expressive application (*vide* the appended ground-plans).

To both workshops is adjoined a small shunting yard either for the collection of the already repaired or the distribution of the to be repaired rolling stock over the different departments or to keep it at the disposal of the traffic-service.

In both workshops the locomotive and also the carriage and carshops have got a common machine-shop, which at Madioen is situated between those sections but at Manggarai partly between them (turning and fittingshop) and partly outside (forge, foundry) in such a manner, however, that as much as possible the transport is following one line and is limited to a minimum.

The mechanical woodworking department is in both cases situated as near as possible to the carriage building shop, therefore here also the transportation is limited to a minimum, whilst the timber is as nearly as possible following a straight line from the staple-yard to the saws.

Furthermore, provision has been made that future extension is rendered possible without interruption of the logical sequence of the whole scheme, which condition may be satisfied entirely, especially with the longitudinal system, by simply lengthening the sheds without in any way impairing the conjunction of the different departments.

The workshops' capacity comprises at Madioen 36 locomotive stands and 36 roof-covered carstands, whilst at Manggarai, initially, provision has been made for the simultaneous presence of 20 locomotives, 50 carriages and 300 cars (the repairs of the latter can mostly be effected in the open air, for which purpose a large yard with the necessary tracks is reserved in front of the workshop buildings.

Although the motive power for both workshops is the same, viz., three-phase current at 220 volts, there is some difference in the driving, to wit, at Madioen in groups, whereby one motor drives a mainshaft supplying power to several machines whilst at Manggarai the single drive system has been preferred, whereby every machine or lathe is driven by its own separate motor fixed to it.

About the arrangement of the cranes in the workshops at Manggarai the following may be mentioned in addition. In the locomotiveshop there are two lifting and traveling cranes with a capacity of 40 tons each with railtracks elevated to such a degree that if need be a locomotive may be lifted and transported right over the other ones. As already has been pointed out, the object of this is to be able to place locomotives on the middle track also when the side-tracks are insufficient or too crowded. These cranes serve also to transfer the boilers to the boilershop which is situated at the back of the locomotiveshop.

Under these elevated tracks are situated those for the 5 tons traveling erecting cranes.

The frequently occurring necessity to carry heavy pieces in the turning shop and in the foundry is served by cranes also of 5 tons capacity.

In the sheds destined for car-repairs there are installed eight 7½ tons traveling cranes acting in pairs and destined to lift cars.

In the carriage-shed we find four 20 tons cranes for the raising of carriage-bodies and also working in pairs. The crane-tracks in the car and carriage sheds, however, are not so elevated, that the vehicles can be lifted clear over each other, such as is the case in the locomotive shop.

On the yard there are furthermore two gantry cranes of 5 tons capacity, one is moving above the wheel-yard, the other one above an open space, where engine-cabs, tenders and such parts are repaired.

In front of the various buildings a "surface traverser" of 40 tons carrying capacity is moving transversely to facilitate the transport in the workshop.

This table has not a sunken track therefore it does not impede the pedestrian traffic in the workshop contrary to the transfer tables at Madioen, which all of them are of less recent design and wholly sunk below ground level.

Mining in Celebes

AT a meeting of the geological and mining society for the Netherlands and colonies at Delft Mr. K. van Vuuren, head of the encyclopedic service in India, lectured on the question as to whether Celebes as a mining country has a future.

First then, from a theoretical standpoint, it may be said that metallic substances are to be found in Celebes ; but it is also quite certain that there are non-metallic substances there also such as phosphate and nitrate in the lime, precious stones, mica which is to be found in large quantities at Banggai, sulphur in every warm spring, potteryclay and sand for manufacturing glass, and the fossil remains of timber.

Secondly, the situation of Celebes for less valuable mining products is unfavorable. Of course there will come an improvement in our transit-trade, should our archipelago play again the roll of " half-way house " between China and Japan on the one side and Australia on the other side ; but this can only have a small influence on mining in Celebes.

Thirdly, traffic conditions on the whole are unfavorable, except in the south-west, and the Malili country.

And lastly, the condition of the soil and the matter of obtaining labor may be regarded as favorable. Food-supplies are excellent.

Resuming once more, Mr. van Vuuren came to the following conclusion : First, there is some reason for mining in Celebes, as in the Verbeek mountains prospecting is easy, provided the electro-metallic process can be used for the ores and the rollers for working up the iron according to the methods drafted by Mr. Koomans can be established there.

The investigation into the possibility of working up the ores by electro-metallurgy ought to be carried out in Holland where a staff of scientific men and extensive laboratories exist so plentifully.

Secondly, the working of the lime by judicious planning and by the use of water-power will give fresh impetus to the nitrogen business which will not be exclusively limited to that particular manufacture ; but there must also be a thorough grasp with regard to the working up of ores by electro-metallurgy.

Thirdly, primitive methods have been employed hitherto by the population, but under the supervision of an experienced mining overseer their working of the inferior layers can be greatly improved.

Fourthly, only those coal-fields in the Maros-district which are necessary to the laying down of a tram-line there, are worth exploiting. The rest of the fields cannot at present be exploited with profit owing to transport difficulties.

Fifthly, with full appreciation of the work carried out individually by our mining engineers in India, it must be said, however, that the way in which it has been done is not altogether satisfactory. In the first place a distinction must be made between the researches made in India and those to be made outside the archipelago ; namely there must be co-operation between the scientific centres in the west and those practically developing the lands in the east. There must also be co-operation between the different government organizations on the spot, while more importance must be attached to the results obtained by private enterprise instead of the thwarting attitude adopted by the authorities hitherto.

Sixthly, with regard to the precious metals, brown coal and petroleum, Celebes would appear according to the latest reports to have no future as a mining country.

Lastly, in connection with the desired co-operation between the scientific centres in Europa and those doing the practical work of developing the lands in the east, Mr. van Vuuren himself accepts the idea, lately established and explained by this society, of tracing by the natural method of research into ores, in accordance with their physical properties.

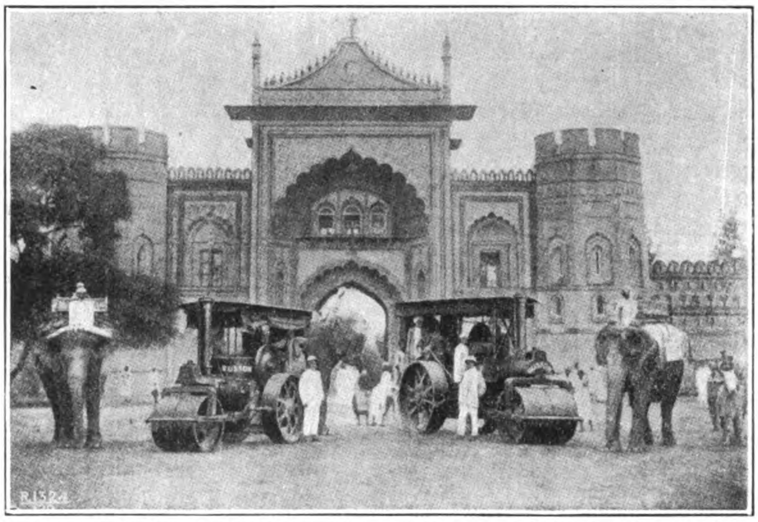
American Colleges for Oriental Women

Just at this time when the church and college women of the United States are in the midst of a campaign to raise $2,000,000 for the Women's Union Christian Colleges of the Orient in order to secure a gift of $1,000,000 offered conditionally by Mr. Rockefeller, the question is frequently asked what and where the colleges are, why they are needed, and by whom and how they came to be selected.

There are seven of the institutions, five colleges and two medical schools. They are the Woman's Christian College at Madras, India ; Ginling College at Nanking, China ; Isabella Thoburn, Lucknow, India ; Women's Medical School at Vellore, India ; Yenching College at Peking, China ; North China Medical, also at Peking, and the Woman's Christian College at Tokyo, Japan.

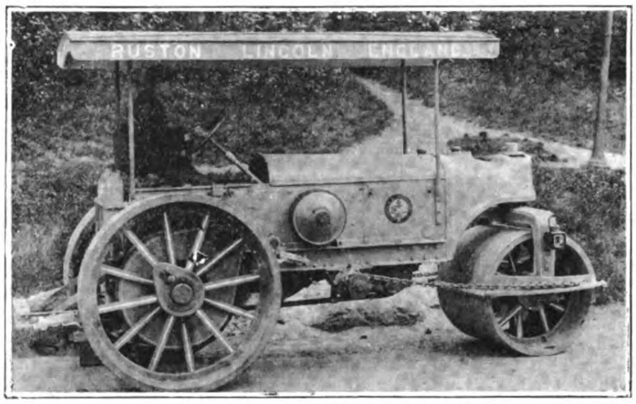
STEAM ROLLERS FOR CHINESE ROADS

With the construction of new roads throughout the country, the Chinese are turning more and more to the modern steam-roller and discarding the old stone or cement-filled iron cylinders hauled by gangs of coolies. Several orders for these machines have been placed in Shanghai for interior road work and the future holds bright for an increasing demand not only for rollers but other modern road-making machinery. Foremost amongst the manufacturers who have developed the road roller to its present high state of efficiency, stands the great British firm of engineers, Messrs. Ruston & Hornsby, Ltd., of Lincoln, England. This firm has met with great success in India, Dutch East Indies, Straits and other parts of Asia, and several of their machines are at work in China and many others in Japan.



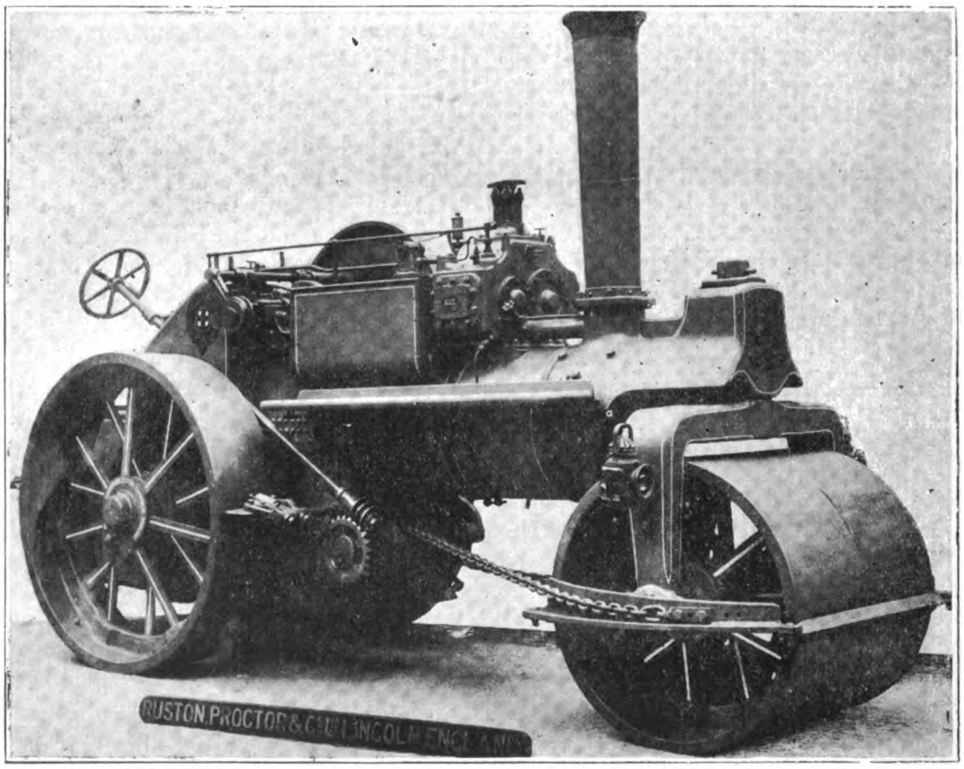
Ruston Rollers at the Entrance to the Palace of H.H. the Nawab of Ramphin, India.

Under all kinds of conditions and in all parts of the world the Ruston rollers are proving in actual use their economy, durability and all-round efficiency. They are made with either single or compound cylinders and in sizes from 5 to 18 tons. In addition to the well-known standard type, this firm makes the Ruston convertible, so built that by easily effected alterations it can be converted into a traction engine. These engines are of exceptional value to municipal authorities, estate owners and road builders, where a roller is not needed for constant use.



The Ruston Motor Road Roller

One of their specialties is a motor roller, made in 6, 7, 8 and 9-ton sizes. They are of the three-wheel type, driven by a two-cylinder vertical paraffine engine placed longitudinally on the frame. They present a very smart appearance, are easily handled, with large wheels and have three speeds, viz., 2.5, 1 and ½ miles per hour.



Ruston Compound Road Roller

The present firm of Ruston & Hornsby, Ltd., is the amalgamation of two old established engineering firms dating back to 1815, Ruston, Proctor & Company, Ltd., of Lincoln, and Richard Hornsby & Sons, Ltd., of Grantham, both pioneers in their lines. In the development of road rollers the name of Ruston has become famous throughout the world and won for its makers the highest awards in many international engineering exhibitions.

In the Ruston compound road roller is found the highest development of these machines. They are made in sizes ranging from 5 to 17 tons empty, rolling a surface of from 5-ft. 9-in. to 7-ft. 3½-in. These rollers are fitted with compound cylinders, the advantages of which are too well-known to need much mention. However, it is well to draw attention to the suitability of this system. In the first place the greater degree of expansion obtained, means that more work is got out of a given volume of steam than when it is only expanded in one cylinder, and therefore, there is a great saving of fuel and water. A further advantage is that owing to the low pressure at which the used steam exhausts into the atmosphere it does so with much less noise, which is a consideration when working in street traffic.

The cylinders are placed side by side with the cranks set at right angles. This eliminates the dead centre position of a single crank, and enables a start to be made on steep inclines by simply opening the throttle valve, and without reversing. In addition, the full pressure on the piston acts equally in all positions of the crankpin. Thus the engine works smoothly and without jar and an extra heavy flywheel is not necessary. An auxiliary valve is provided for admitting high-pressure steam direct into the low-pressure cylinder, giving greatly increased power for starting and climbing on very steep inclines.

Owing to the compound engine developing more power from the same amount of steam than a single-cylinder engine, the rate of fuel combustion is much slower than in the firebox of a single cylinder engine developing the same power, owing to the demand on the boiler not being so severe, consequently the firebox and boiler tubes of the compound road roller will last much longer than those of the single cylinder road roller.

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While you are planning your trip to the United States, remember that you can make hotel reservations for New York and other important cities right here at home. In the case of the Statler-operated hotels, see Messrs. Thos. Cook & Sons—or you can write direct to the hotels, in America, and your letter will have the most careful attention.

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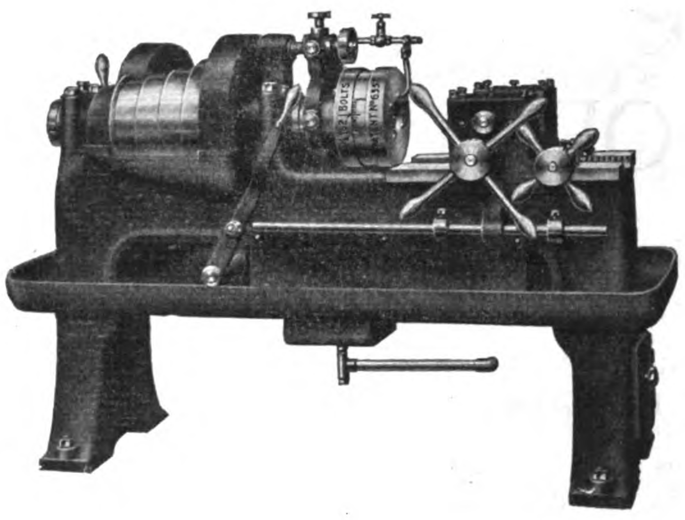
Heap's Patent Screwing Machines



are made in all sizes, and suitable for dealing with all classes of work.

The illustration opposite shows our 2in. Patent Automatic Bolt Screwing Machine which is one of a complete line of Single and Multiple Head Machines specially designed for use wherever large quantities of Bolts have to be dealt with in the most expeditious and economical manner.

We will gladly advise you as to the most suitable machine for your particular class of work.

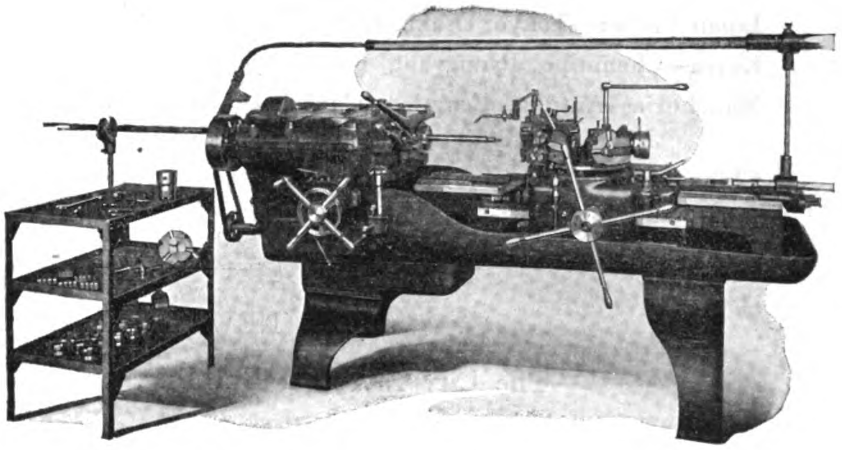
Catalogue free on request.

JOSHUA HEAP & CO., LTD.,

ASHTON-UNDER-LYNE, ENGLAND.

For the Small Shop or the Large One

The Hartness Flat Turret Lathe *fits the small shop*—even the shop so small that it has only just broken the habit of making a piece at a time. The Hartness Flat Turret Lathe *made a lasting reputation* for itself in the days of the small shop, on work which was *put through in small lots*. Its universal tool equipment was specially designed for this condition. The machine has since been *tremendously improved;* the improvements have increased its effectiveness *for small lot manufacturing*.



At the same time, the Hartness Turret Lathe is the *standard machine for large-lot manufacturing in big establishments*. The strength, stiffness, power and accuracy of the machine have given it a place held by no other. On bar or chuck work within its range *its output per machine or per dollar of investment is unmatched*.

Catalogue and descriptive literature sent post free on request.

Jones & Lamson Machine Company

9-10 Water Lane, London, England
Cable Address: "Turretorum" London

Springfield, Vermont, U.S.A.
Cable Address: "Turret" Springfield, Vt.

THE BANK OF CHOSEN

Capital Subscribed - - - Yen 80,000,000
Capital Paid-up - - - Yen 50,000,000

Governor: S. Minobe, Esq.
Deputy-Governor: T. Kano, Esq.

Directors:

S. Ohta, Esq. S. Katayama, Esq.
S. Yoshida, Esq. S. Kakei, Esq.

Head Office: SEOUL (Chosen)

FOREIGN DEPARTMENT: TOKYO

(All communications relating to correspondence arrangements and the Bank's general foreign business to be addressed to the Foreign Department)

Branches:

Japan Proper—Tokyo, Osaka, Kobe, Shimonoseki
Korea—Chemulpo, Pyengyang, Fusan, Wonsan, Taiku, Chinnampo, Kunsan, Mokpo, Hoilyong, Chongjin
Manchuria—Antung, Fengtien (Mukden), Dairen, Yingkow (Newchwang), Changchun, Harbin, Tiehling, Liaoyang, Ryojun, Kaiyuan, Chengchiatun, Szupingchieh, Fuchiatien, Kirin, Lungchingtsun
China Proper—Shanghai, Tientsin, Tsingtao, Tsinan
Siberia—Vladivostock, Alexandrofsky Post

NEW YORK AGENCY:

The City Investing Building, 165 Broadway, New York City

LONDON REPRESENTATIVE:

Gresham House, 24 Old Broad Street, London, E. C. 2

Correspondents:

San Francisco, Seattle, New York, London, Paris and in other commercial centers throughout the world

International Banking Corporation

CAPITAL AND SURPLUS - - - - U.S. $10,000,000
UNDIVIDED PROFITS - - - - 5,400,000
RESERVE FOR DIVIDENDS - - - 600,000

OWNED BY THE NATIONAL CITY BANK OF NEW YORK

HEAD OFFICE: 60 WALL STREET, NEW YORK

LONDON OFFICE: 36 BISHOPSGATE, E.C.

LYONS OFFICE: 27 PLACE TOLOZAN

SAN FRANCISCO OFFICE: 232 MONTGOMERY STREET

BRANCHES:

CHINA
- SHANGHAI
- PEKING
- TIENTSIN
- HANKOW
- HARBIN
- HONGKONG
- CANTON

DOMINICA
- SANTO DOMINGO
- SANCHEZ
- SAN FRANCISCO
- SAN PEDRO
- SANTIAGO
- PUERTO PLATA
- BARAHONA
- LA VEGA

INDIA
- BOMBAY
- CALCUTTA
- RANGOON

JAPAN
- YOKOHAMA
- KOBE

JAVA
- BATAVIA
- SOURABAYA

PANAMA
- PANAMA
- COLON

PHILIPPINES
- MANILA
- CEBU

SPAIN
- BARCELONA
- MADRID

STRAITS SETTLEMENTS
- SINGAPORE

We are also able to offer our Customers the services of the Branches of the National City Bank of New York in the principal countries of South America, Central America and in the West Indies.

Commercial and Travellers' Letters of Credit, Bills of Exchange and Cable Transfers bought and sold. Current Accounts opened and Fixed Deposits in local and foreign currencies taken at rates that may be ascertained on application to the Bank.

H. C. GULLAND, *Manager*.

1A KIUKIANG ROAD.

BANQUE DE L'INDO-CHINE.

Capital	**Frs. 72,000,000**
Reserves	**„ 70,000,000**

HEAD OFFICE: 15 BIS RUE LAFFITTE, PARIS.

Succursales et Agencies:

Bangkok, Battambang, Canton, Djibouti, Haiphong, Hankéou, Hanoi, Hongkong, Mongtze, Nouméa, Papeete, Peking, Pnom-Penh, Pondichery, Saigon, Shanghai, Singapore, Tientsin, Tourane

Bankers:

IN FRANCE: Comptoir National d'Escompte de Paris, Credit Lyonnais; Banque de Paris et des Pays-Bas; Crédit Industriel et Commercial Société Générale.

IN LONDON: The National Provincial and Union Bank of England, Ltd.; Comptoir National d'Escompte de Paris; Crédit Lyonnais.

The Shanghai Agency undertakes all banking operations and exchange business; grants credits on goods and approved securities and receives deposits on current and fixed deposits according to arrangement.

L. ARDAIN, *Manager.*

JUGO GINKO, LIMITED

(THE FIFTEENTH BANK)

TOKYO, JAPAN

Telegrams: "Jugo Tokio"

Capital Subscribed Y. 100,000,000 Capital Paid-up Y. 49,750,000 Reserve Funds Y. 23,900,000

***President*: The Hon. Iwao Matsukata *Vice-President*: Masayasu Naruse, Esq.**

***Managing Directors*: Yutsuha Sato, Esq. and Kanesato Aiko, Esq.**

***Head Office Manager*: Sei Usagawa, Esq.**

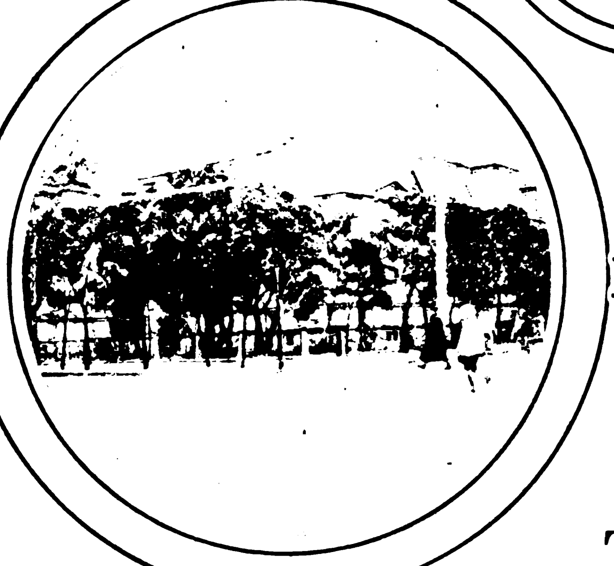
***Head Office*: No. 6, 7chome, Kobiki-cho, Kyobashiku, Tokyo.**

BRANCHES:

SHIMBASHI, MARUNOUCHI, GOFUKUBASHI, TOHORISANCHOME, KAKIGARACHO, NINGYOCHO, RYOGOKU, FUKAGAWA, KANDA (TOKYO). OSAKA, SENBA, TAMATSUKURI, NISHI, KUJO, MINAMI, NAMBA, TENNOJI, KITA, TENGACHAYA (OSAKA). KOBE, SAKAEMACHI, FUKIAI, HYOGO (KOBE). KYOTO, NAGOYA, SAKAI, WAKAYAMA, NISHINOMIYA, OKAYAMA, HIROSHIMA, SHIMONOSEKI, FUKUOKA, KUMAMOTO, KAGOSHIMA, SENDAI.

LONDON BANKS AND AGENTS:

LAZARD BROTHERS & CO., LTD. LONDON COUNTY WESTMINSTER AND PARR'S BANK, LTD. UNION DISCOUNT CO. OF LONDON, LTD.



THE BANK OF TAIWAN LTD.

INCORPORATED BY SPECIAL IMPERIAL CHARTER, 1899

Capital Subscribed - - - - - - -	Yen 60,000,000
Capital Paid-up - - - - - - -	,, 45,000,000
Reserve Funds - - - - - - -	,, 9,680,000

President: KOJURO NAKAGAWA, Esq. Vice-President: SHUNROKURO MORI, Esq.

DIRECTORS:

TSUNEKICHI IKEDA, Esq. KUMEMATSU MORINAGA, Esq.
GUNJI KAWASAKI, Esq. MASUMI ESAKI, Esq.
TADASU HISAMUNE, Esq.

Head Office: **TAIPEH, FORMOSA (TAIWAN)**

BRANCHES:

JAPAN: Tokio (General Affairs Department), Kobe, Moji, Osaka, Yokohama.
TAIWAN: Keelung, Tainan, Takow, and 11 other points.
CHINA: Amoy, Canton, Foochow, Hankow, Kiukiang, Shanghai, Swatow.
OTHERS: Bangkok, Batavia, Bombay, Hongkong, London, New York, Semarang, Singapore, Soerabaya.

AGENTS AND CORRESPONDENTS:

In the Principal Cities and Towns throughout the World.

LONDON BANKERS:

BARCLAYS BANK, LTD. LLOYD'S BANK, LTD. LONDON COUNTY WESTMINSTER & PARR'S BANK, LTD.

TOKYO BRANCH:

No. 1, Eiraku-cho Ni-chome, Kojimachi-ku.

Telegraphic Address: "TAIWANGINK."

Phone Nos. 1060, 1061, 1062, 1063, 1064, 1065, 1066, 446, 447, 448 and 449, Marunouchi.

Interest allowed on Fixed Deposits, and Current Accounts on terms which may be ascertained on application. Most favourable terms are granted for Petty Current Accounts.

Every description of Exchange and General Banking business transacted.

Special facilities are available for exchange business on China, Straits Settlements, East Indies, Australia, Great Britain, Russia, America, Canada, South Africa, etc.

Industrial Bank of Japan, Limited

(NIPPON KOGYO GINKO)

Incorporated by Special Charter in 1902 to Encourage Foreign Investments

CAPITAL SUBSCRIBED - - - - - -	Yen 50,000,000
CAPITAL PAID-UP - - - - - - -	Yen 45,000,000

HEAD OFFICE:

MARUNOUCHI, TOKYO. CABLES "KOGIN," TOKYO

BRANCHES:

TOKYO: NIHONBASHI
OSAKA: KORAIBASHI
KOBE: NAKAMACHI

H. HIJIKATA, Esq., President
Y. ONO, Esq., Vice-President
K. IYANAGA, Esq., Director
T. IWASA, Esq., Director
KOZO MATSUMOTO, Esq.

AUDITORS:

NAGATANE SOMA, Esq.
KINTARO HATTORI, Esq.
KINICHI KAWAKAMI, Esq.
TAICHI OHBA, Esq.

All descriptions of general banking, exchange, both foreign and domestic, and trust and corporation financial business transacted.

Correspondents in the principal cities at home, and in London, Paris, New York, and San Francisco.

BUSINESS TRANSACTED:

1.—Loans on the security of public bonds of debentures and shares, estates (Zaidan), specified land and buildings.
2.—Subscription and underwriting public bonds or debentures.
3.—Deposits and safe custody of valuables.
4.—Trust company business.
5.—Discounting of bills.
6.—Foreign exchange business.
7.—Other banking business sanctioned by the Minister of State for Finance in accordance with Law of Ordinance.

BANK OF COMMUNICATIONS

(Specially authorised by Presidential Mandates of April 7th, 1914 and October 31st, 1915 making the Bank of Communications a National Bank).

Head Office: Peking

CAPITAL . . Kuping Tls. 10,000,000

President: TSAO JOU LIN

Vice-President: JEN FUNG PAO

Every description of Banking and Exchange business transacted.
Interest allowed on Current Accounts and Fixed Deposits according to arrangement.
Credits granted on approved Securities.
Special Facilities for Transfers to all parts of China.

Branches

CHIHLI PROVINCE.—Peking, Tientsin, Tungchow, Paotingfu, Haitien, Tangshan, Shuntefu, Shengfang.

SHANTUNG PROVINCE.—Tsinanfu, Tsininchow, Chefoo, Techow, Tsaochwang, Lungkow.

HONAN PROVINCE.—Kaifeng, Lohyang, Chengchow, Chiaotso, Chowchiakow, Taokow, Leiho, Hsinhsiang, Changtefu, Hsinyangchow.

SHANSI PROVINCE.—Shihchiachwang, Tatungfu, Fengcheng, Yangkao.

KIANGSU PROVINCE.—Shanghai, Soochow, Wusieh, Chinkiang, Yangchow, Tsing-kiangpu, Pukow, Penpu, Hsuchow.

CHEKIANG PROVINCE.—Hangchow, Ningpo.

HUPEH PROVINCE.—Hankow, Shasi, Ichang.

KIANGSI PROVINCE.—Kiukiang.

HUNAN PROVINCE.—Changsha, Changteh, Yochow, Hengchow, Hsiangtan

SZECHUAN PROVINCE.—Chungking.

ANHWEI PROVINCE.—Wuhu, Anking, Hsuancheng, Panpu

KWANGTUNG PROVINCE.—Canton.

THREE EASTERN PROVINCES.—Yinkow, Fengtien, Changchun, Kirin, Tiehling, Sunchiatai, Liaoyang, Harbin, Chinhsien.

SPECIAL DISTRICTS.—Jehol, Kueihuacheng, Lenghsien, Chihfeng, Hsinsi, Kalgan (Chahar).

ABROAD.—Hongkong, Singapore.

THE SUMITOMO GOSHI-KAISHA

OSAKA, JAPAN

OWNERS OF BESSHI COPPER MINE, COAL MINES, SILVER AND GOLD MINES, ETC.

MANUFACTURERS OF

Tubes, Plates, Sheets and Bars of Copper, Brass, Bronze and other Alloys, Solid and Drawn Steel Tubes, Nails, Etc.—Superphosphate and Composite, Manure, Sulphuric and Nitric Acid, etc.

GENERAL WAREHOUSE AND BANKING BUSINESS

WORKS AND DEPARTMENTS

Warehouses	Osaka, Kobe & Tokyo
Mining Offices	Besshi, Wakamatsu, Sapporo & Ohgayu
WORKS:	
Copper Works	Osaka & Amagasaki
Fertilizer Works	Niihama
Sales Departments	Osaka, Kobe, Tokyo, Kure, Yokosuka, Hakata, Shanghai, Hankow and Tientsin

THE SUMITOMO STEEL WORKS, LTD.

OSAKA, JAPAN

President: Baron K. SUMITOMO

MANUFACTURERS OF

Steel Ingots, Steel Forgings, Steel and Iron Castings of Every Description for Railways, Shipbuilding Yards, Mines, Hydraulic Electric and Other Engineering Works, etc., etc.

THE SUMITOMO ELECTRIC & CABLE WORKS, LIMITED

OSAKA, JAPAN

President: Baron K. SUMITOMO

MANUFACTURERS OF

Copper, Brass, Bronze and Nickel Wires and Strips, Trolley Wires, Insulated Wires and Cables of Every Description for Telephone, Telegraph, Lighting, Power Transmission, etc., etc.

THE SUMITOMO BANK, LIMITED

Head Office: OSAKA, JAPAN

Cable Address: "SUMITBANK"

President: Baron K. SUMITOMO

Established March, 1912

(Successors to The SUMITOMO BANK)

Capital Subscribed	Yen 70,000,000	Reserve Fund	Yen 22,500,000
Capital Paid-up	„ 50,000,000	Deposits	„ 369,000,000

Head Office: Kitahama, Osaka

City Offices: Semba, Bingomachi, Nakanoshima, Dotonbori, Kawaguchi, Tenma, Nipponbashi.

Home Branches: Tokyo (Tokyo, Toriaburacho, Fukagawa, Shinbashi, Asakusa), Yokohama, Nagoya, Kyoto (Kyoto and Nishijin), Kobe (Kobe and Hyogo), Onomichi, Niihama, Kure, Hiroshima, Yanai, Shimonoseki, Moji, Wakamatsu, Kokura, Hakata and Kurume.

Foreign Branches: Shanghai, Hankow, Bombay, London, New York and San Francisco.

Agents: The Sumitomo Bank of Hawaii, Ltd., Honolulu, Lloyds Bank, Ltd., London, National City Bank of New York, New York.

Correspondents: In all important places at home and abroad.

The Bank buys, sells and receive for collection Drafts and Telegraphic Transfers, issues Commercial and Travellers Letters of Credit available in all important parts of the world, besides doing general Banking business.

THE

MITSUBISHI BANK,

LIMITED

CAPITAL SUBSCRIBED - Yen 50,000,000
CAPITAL PAID-UP - - - Yen 30,000,000

CHAIRMAN:

Mr. Manzo Kushida

MANAGING DIRECTORS:

Mr. Kiyoshi Sejimo Mr. Mikitaro Kikuchi
Mr. Takeo Kato

HEAD OFFICE:

No. 3 Yayesucho Nichome, Kojimachi-ku,
Tokyo, Japan.

BRANCH OFFICES:

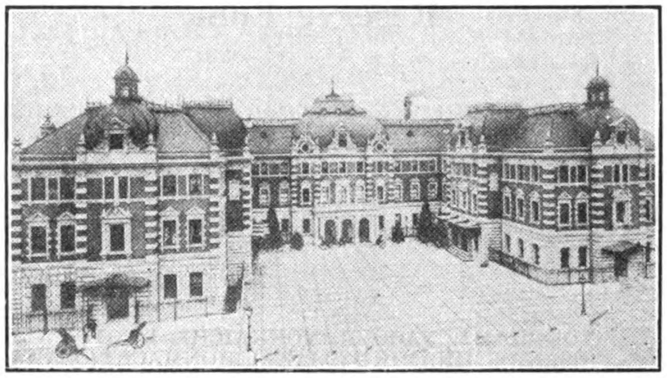
Fukagawa (Tokyo), Marunouchi (Tokyo), Nihombashi (Tokyo), Osaka, Nakanoshima (Osaka), Semba (Osaka), Kobe, Kyoto, Nagoya, Shanghai, New York and London.

General Banking and Exchange Business

Agents for the Hongkong and Shanghai Banking Corporation

THE MITSUI BANK, LTD.

The Oldest Bank in Japan, Founded in 1673



Capital Subscribed... ....Y. 100,000,000.00
Capital Paid-Up....................Y. 60,000,000.00
Reserve Fund (July 1921)......Y. 28,000,000.00

HEAD OFFICE:

No. 1 Suruga-cho, Nihonbashi-ku,
TOKYO

BOARD OF DIRECTORS:

GENYEMON MITSUI, Esq. (*President*); SEIHIN IKEDA, Esq., UMEKICHI YONEYAMA, Esq., NAOJIRO KIKUMOTO, Esq. and OTOHIKO MAJIMA, Esq. (*Managing Directors.*)

TOMITARO HARA, Esq., KANETARO KISHIMOTO, Esq., HIROKICHI KAMESHIMA, Esq. and KIKUSABURO FUKUI, Esq. (*Directors*).

Branches:

NIHONBASHI (Tokyo), OTARU, YOKOHAMA, NAGOYA, KYOTO, OSAKA, NISHI (Osaka), KAWAGUCHI (Osaka), NAKANOSHIMA (Osaka), KOBE, HIROSHIMA, SHIMONOSEKI, MOJI, WAKAMATSU, FUKUOKA, NAGASAKI, SHANGHAI.

Foreign Agents:

London: Barclays Bank, Ltd.
London Joint City & Midland Bank, Ltd.

New York: The National City Bank of New York.
The Chase National Bank.
Bankers Trust Co.

Paris: Banque de l'Union Parisienne.
Comptoir National d'Escompte de Paris.

Bombay: National Bank of India, Ltd.

THE DAI-ICHI GINKO, LTD.

(FORMERLY THE FIRST NATIONAL BANK)

ESTABLISHED 1873

Subscribed Capital - - -	Yen 50,000,000.00
Paid-Up Capital - - - -	Yen 36,350,000.00
Reserve Fund - - - -	Yen 31,500,000.00

Y. SASAKI, *President*

K. ISHII, *Managing Director.* Y. NOGUCHI, *Managing Director.* S. SUGITA, *Managing Director.*

HEAD OFFICE:

No. 1 KABUTO-CHO, NIHONBASHI-KU, TOKYO.

T. AKASHI, *Manager*

CITY BRANCHES:

ISECHO, SHIN-OSAKACHO, FUKAGAWA, MARUNOUCHI.

HOME BRANCHES:

YOKOHAMA, NAGOYA, YOKKAICHI, KYOTO, NISHIJIN (KYOTO), GOJO (KYOTO), FUSHIMI, OSAKA, NISHIKU (OSAKA), MINAMIKU (OSAKA), HONMACHI (OSAKA), KOBE, HYOGO, HIROSHIMA, SHIMONOSEKI, CHOFU, MOJI, FUKUOKA, KURUME, KUMAMOTO, HAKODATE, OTARU, SAPPORO, MURORAN.

BRANCHES IN COREA:

SEOUL, FUSAN.

LONDON & NEW YORK BANKERS:

London: London County Westminster & Parr's Bank, Ltd.; The London Joint City & Midland Bank, Ltd.; The Yokohama Specie Bank, Ltd.

New York: The National City Bank of New York.; The National Bank of Commerce in New York.; The Yokohama Specie Bank, Ltd.

CORRESPONDENTS:

The Bank, in addition to its own Branches, has numerous Agencies or Correspondents in the principal Cities and Towns at Home and Abroad.

THE ONE HUNDREDTH BANK, LTD.

(DAI HYAKU GINKO)

HEAD OFFICE, AWOMONO-CHO, TOKYO

TOKYO BRANCHES: No. 1 Torihatagocho' Nihonbashi: No. 10, Ginza Nichome, Kyobashi
YOKOHAMA BRANCH: Nos. 53-55 Honcho Shichome
OSAKA BRANCH: 28 Bingo-machi, Nichome
KYOTO BRANCH: Shijo Higashinotoin
SHINMACHI BRANCH: Shinmachi Dori Sanchome

President: K. IKEDA, Esq.

Managing Director: S. CHOH, Esq.

SUBSCRIBED CAPITAL - - - - -	Yen 25,000,000
CAPITAL PAID-UP - - - - - -	Yen 17,500,000
RESERVE FUND - - - - - -	Yen 8,094,340
DEPOSITS - - - - - - - - -	Yen 110,740,264

Transacts General Banking and Foreign Exchange Business. Conducts Trust Company Business

Hongkong and Shanghai Banking Corporation

Paid-up Capital $20,000,000
Reserve Funds: Sterling £4,500,000
Silver $23,500,000
Reserve Liability of Proprietors $20,000,000

Court of Directors:

G. M. DODWELL, Esq., Chairman
Hon. Mr. A. O. LANG, Deputy Chairman
D. G. M. BERNARD, Esq.
G. T. M. EDKINS, Esq.
P. H. HOLYOAK, Esq.
Hon. Mr. E. V. D. PARR
W. L. PATTENDEN, Esq.
A. M. BOWES SMITH, Esq.
H. P. WHITE, Esq.

Head Office:
HONGKONG

Chief Manager:
HONGKONG . . . Hon. Mr. A. G. STEPHEN

London Bankers:
LONDON COUNTY WESTMINSTER AND PARR'S BANK LTD.

Shanghai Branch: 12 The Bund
Sub-Agency: 9 Broadway

Branches and Agencies:

AMOY	LONDON
BANGKOK	LYONS
BATAVIA	MALACCA
BOMBAY	MANILA
CALCUTTA	NAGASAKI
CANTON	NEW YORK
CHEFOO	PEKING
COLOMBO	PENANG
DAIREN	RANGOON
FOOCHOW	SAIGON
HAIPHONG	S. FRANCISCO
HAMBURG	SHANGHAI
HANKOW	SINGAPORE
HARBIN	SOURABAYA
ILOILO	SUNGEI PATANI
IPOH	TIENTSIN
JOHORE	TSINGTAO
KOBE	VLADIVOSTOCK
KUALA LUMPUR	YOKOHAMA

Interest allowed on Current Accounts and on Fixed Deposits according to arrangement.

Local Bills Discounted. Credits granted on approved Securities and every description of Banking and Exchange business transacted Drafts granted on London and the chief commercial places in Europe, India, Australia, Africa, China, Japan and America.

G. H. STITT, *Manager.*

THE ROYAL BANK OF CANADA

HEAD OFFICE, MONTREAL.

LONDON, ENG. PRINCES ST., E.C.
NEW YORK. 68, WILLIAM ST.
PARIS, FRANCE. THE ROYAL BANK OF CANADA (FRANCE)
BARCELONA. PLAZA DE CATALUNA 6

702 BRANCHES.

594 BRANCHES IN CANADA AND NEWFOUNDLAND, ALSO

108 FOREIGN BRANCHES.

ARGENTINA Buenos Aires (2 Branches).
BRAZIL Rio de Janeiro, Santos. Sao Paulo.
URUGUAY Montevideo.
VENEZUELA Caracas, Ciudad Bolivar. Maracaibo.
COLOMBIA Barranquilla.
COSTA RICA San José.

WEST INDIES

CUBA—Havana (9 Branches), Antilla, Banes, Bayamo, Caibarien, Camaguey, Camajuani, Cardenas, Ciego de Avila, Cienfuegos, Cruces, Cueto, Florida, Guantanamo, Jatibonico, Manzanillo, Matanzas, Moron, Nuevitas, Palma Soriano, Pinar del Rio, Puerto Padre, Sagua la Grande, Sancti Spiritus, Santa Clara, Santiago de Cuba, and at twenty other points.
PORTO RICO—San Juan, Mayaguez & Ponce. **HAITI**—Port-au-Prince, etc.
DOMINICAN REPUBLIC—Santo Domingo, La Romana, Puerto Plata, Sanchez, San Pedro de Macoris and Santiago de los Caballeros.
MARTINIQUE—Fort de France.
GUADELOUPE—Pointe-à-Pitre and Basse Terre.
BRITISH WEST INDIES—Antigua, Bahamas, Barbados, Dominica, Grenada, Jamaica, Montserrat, Nevis, St. Kitts, St. Lucia, Trinidad and Tobago.
BRITISH GUIANA—Georgetown, New Amsterdam, etc.
BRITISH HONDURAS—Belize.

CAPITAL PAID UP AND RESERVES ... $41,000,000 GOLD
TOTAL RESOURCES ... ... $470,000,000 GOLD

The First National Bank of Boston

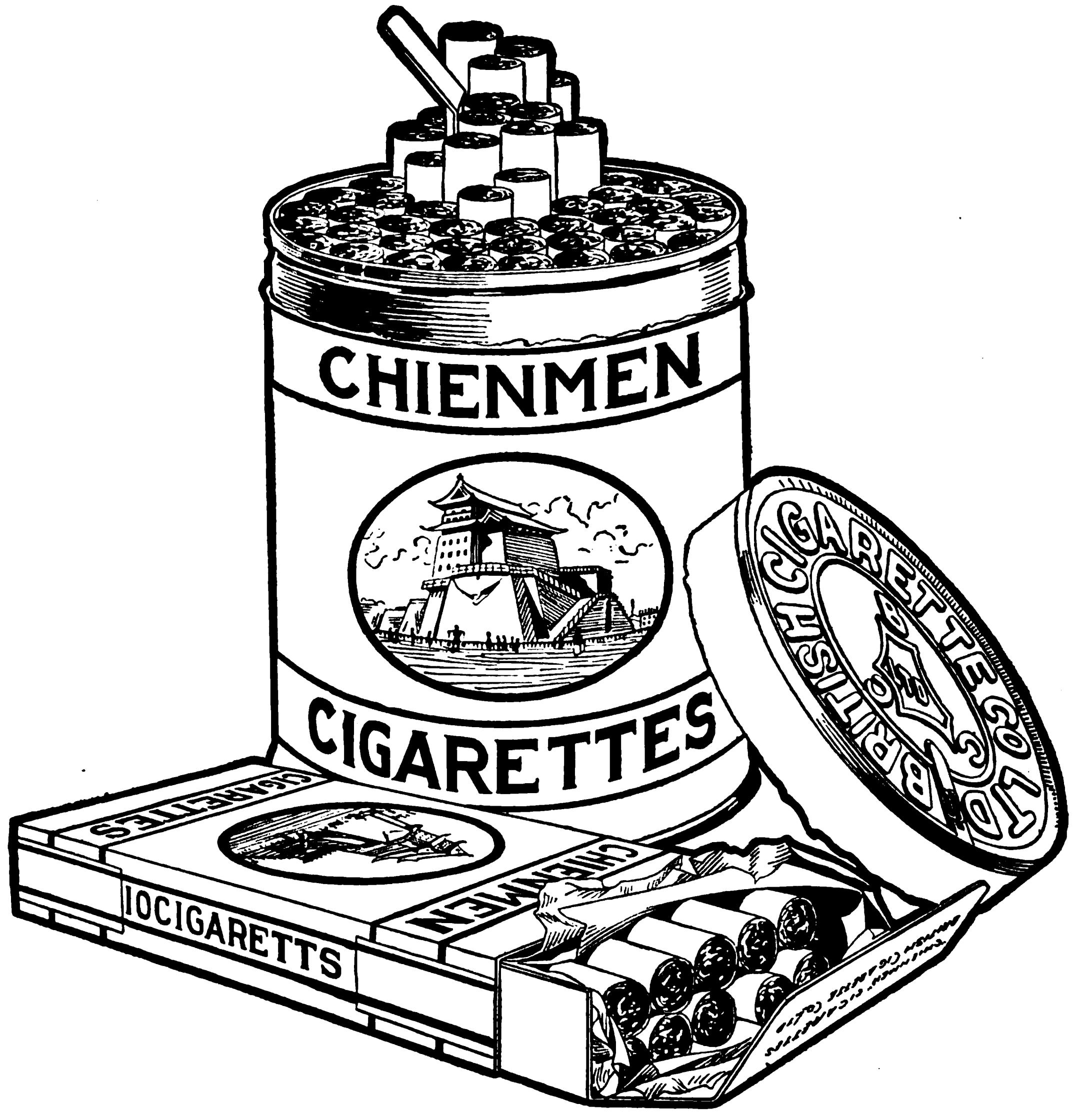
The leading financial institution of New England

Foreign and domestic commercial banking of every nature.

Correspondence solicited.

CHIENMEN

Cigarettes



A brand well known to the "High Grade Cigarette Smoking Public" of China.

BRITISH-AMERICAN TOBACCO CO. (CHINA), LTD.

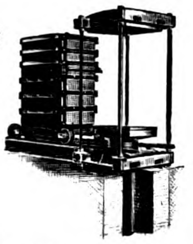
Distributors

Tel. Address: "OMO" | **Codes:** A.B.C. 4th & 5th Edition | **Established** 1810

To Exporters and Manufacturers

who require

Hydraulic Presses



Hydraulic Packing Press, for Cotton Waste, etc.

for packing goods of every description, for Home and Foreign transport.

May we have your enquiries ?

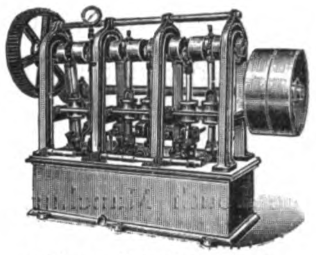
We make Presses and Pumps for Hand, Steam, and Electric Power.

EDWIN MILLS & SON LTD.

Wakefield Road,

Aspley,

HUDDERSFIELD.



6 Throw Belt Driver Pump

Hydraulic Leathers, Pipes and Fittings always in stock.

DIAMOND

SOOT BLOWERS

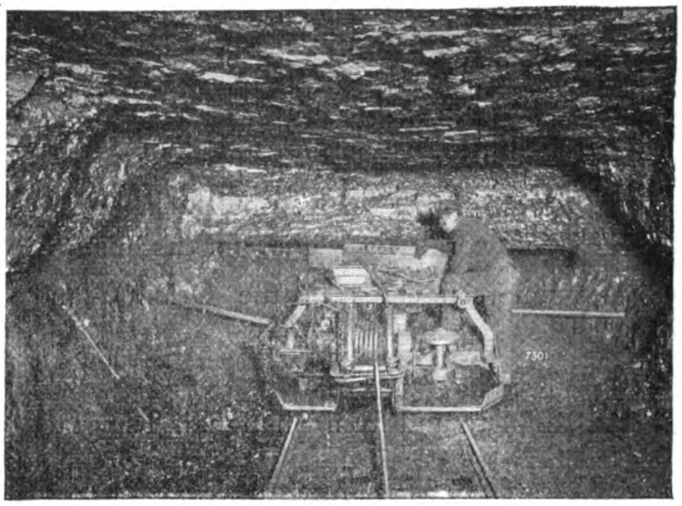
For all types of
high - pressure
Steam Boilers

MANUFACTURED BY

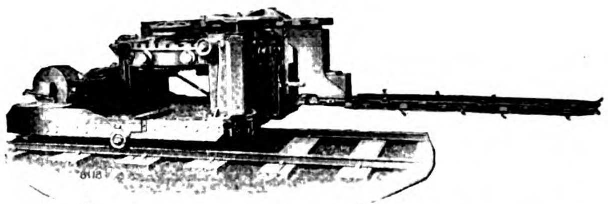
DIAMOND POWER SPECIALTY CORPORATION

(SUCCESSORS to DIAMOND POWER SPECIALTY CO.)

10340 Oakland Ave.,
Detroit, Michigan,
U. S. A.



Entry Driving, showing machine cutting out Dirt Binder— Is adjustable while in operation to an irregular binder.



"Arcwall" Coal Cutter with "offset Cutter Bar" for cutting on or near the bottom.

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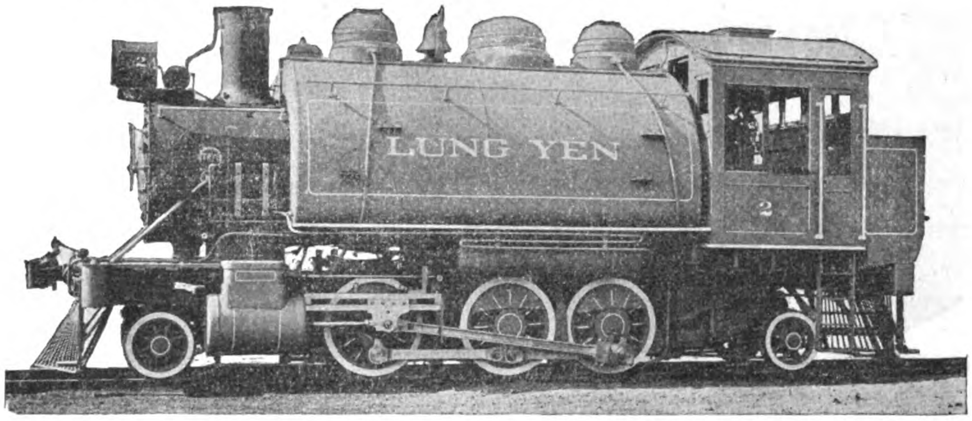

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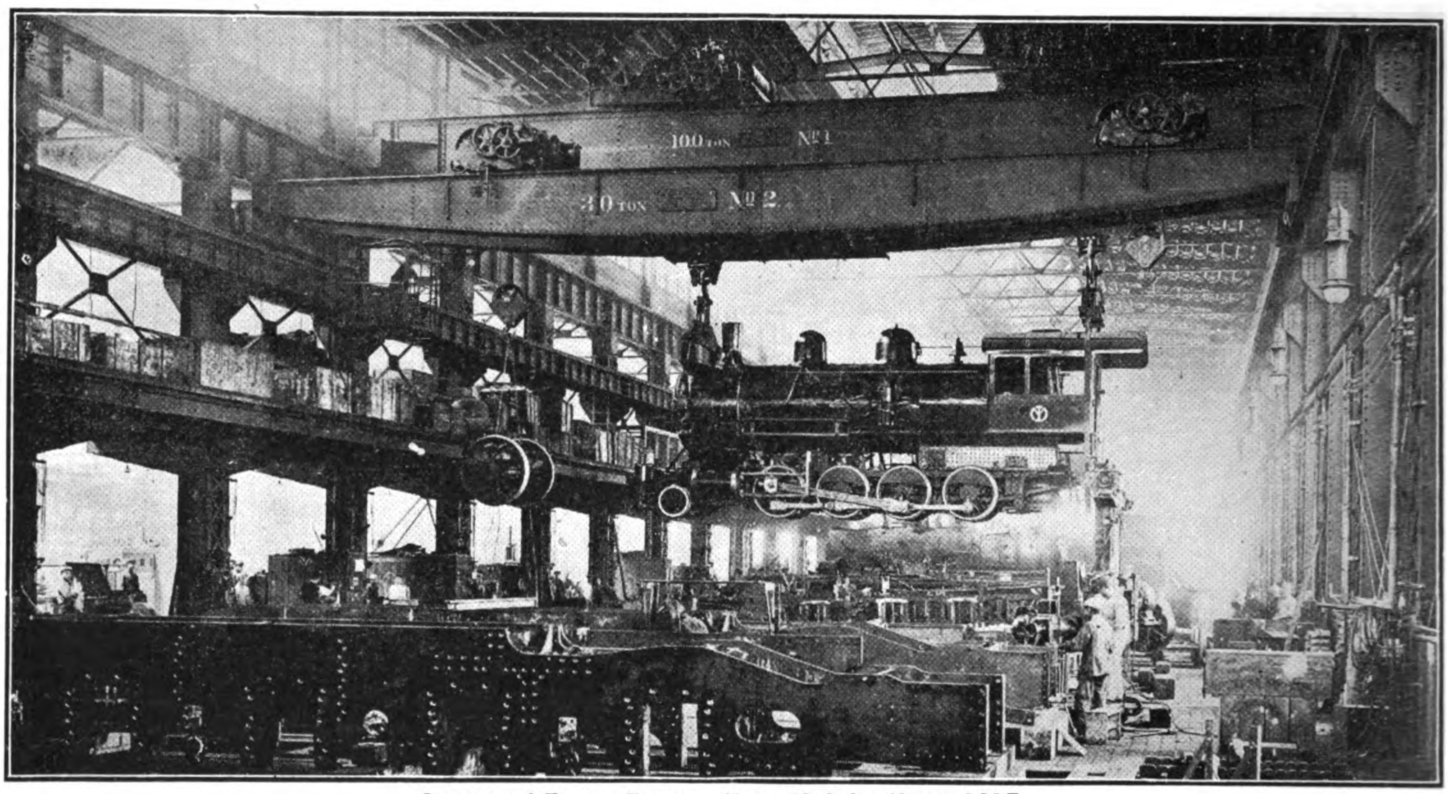

Interior of Engine Erecting Shop, Shakako Shops, S.M.R.

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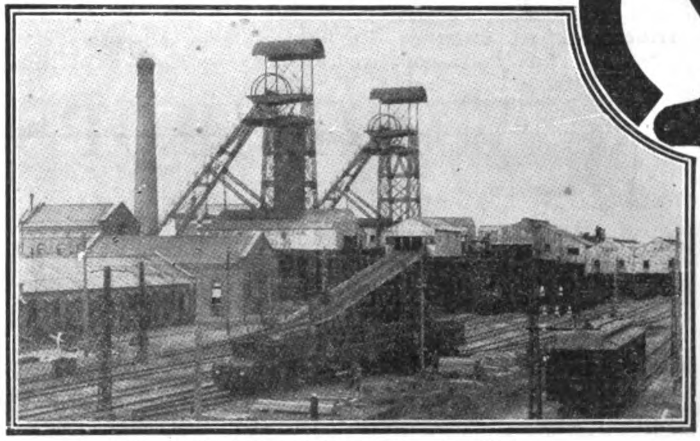
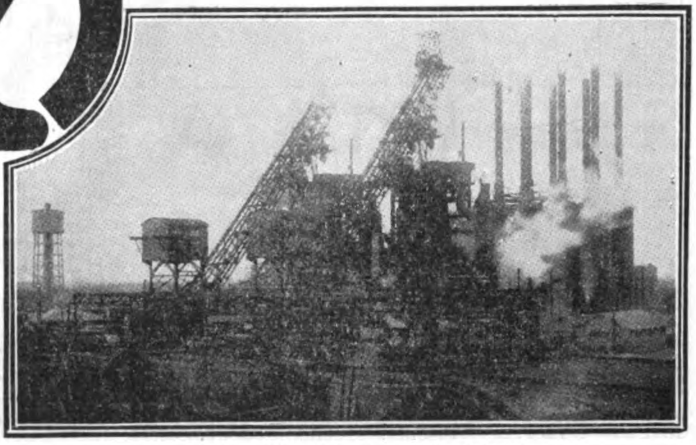


Togo Pit of the S.M.R. Fushun Collieries



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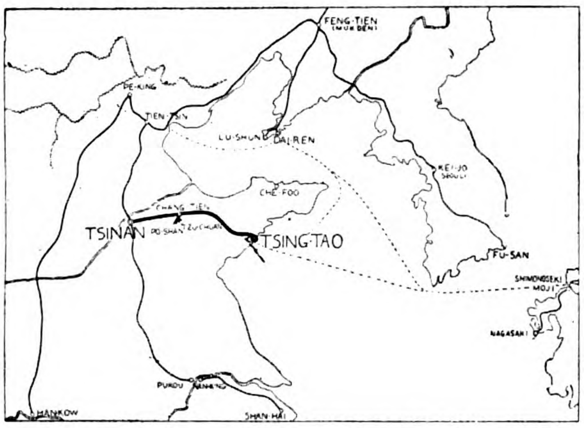


THROUGH TRAFFIC

Through passenger tickets are issued between the following principal stations of the Shantung Railway: Kiaochow, Kaomi, Fangtsu, Weihsien, Chingchow, Changtien, Choustun, Tsinan, Tzuchuan, Poshan, and the following points: In Manchuria—Port Arthur, Newchwang, Liaoyang, Fushun, Mukden, Tiehling, Kaiyuan, Changchun, Penchihu, Antung, and Dairen; in Japan—Tokyo, Yokohama, Nagoya, Kyoto, Osaka, Kobe, Ujina, Moji, Shimonoseki, Nagasaki and Shanghai.

Steamer Connections—Steamers leave the wharves of the Large Harbour, Tsingtao, for Moji and Kobe every five days, for Shanghai about twice a week and for Dairen about three times a week.

For giving facilities to through passengers for Japan, a special train in connection with the night train No. 4 is operated from the Harbour Station to the Wharf, direct alongside the ship, on those days when the liners of the Nippon Yusen Kaisha, Osaka Shosen Kaisha, and Harada S.S. Co. are leaving.

Through passengers and their luggage are carried free of charge for this section.

Collieries—The Tzuchuan (Shisen) and Fangtzu (Boshi) Collieries are managed by the Mining Department of the Shantung Railway. At present the daily output of Tzuchuan coal is about 1,500 tons, far surpassing the amount taken out when the Germans were in control. The coal is well-known for its good quality and fair price.

Tsinan—Tsinan, the capital of Shantung, is the western terminus of the Shantung Railway, and also one of the most important stations on the Tientsin-Pukow Railway.

The Tsinan Railway Hotel, furnished in modern European style, is found on the upper floor of the Tsinan Station, under the control of the Shantung Railway Administration.

THROUGH TRAIN SERVICE

Train No. 1 leaves Tsingtao daily 10.00 p.m. arrives Tsinan 8.00 a.m.
Train No. 3 leaves Tsingtao daily 8.00 a.m. arrives Tsinan 6.40 p.m.
Train No. 2 leaves Tsinan daily 11.00 p.m. arrives Tsingtao 8.35 a.m.
Train No. 4 leaves Tsinan daily 10.10 a.m. arrives Tsingtao 8.20 p.m.

Local Trains run between Tsingtao and Kaomi, Weihsien and between Fangtzu and Tsinan, and on the Poshan and Tzuchuan colliery branches.

Fares—Tsingtao-Tsinan—1st class, $14.30 ; 2nd class, $7.20.

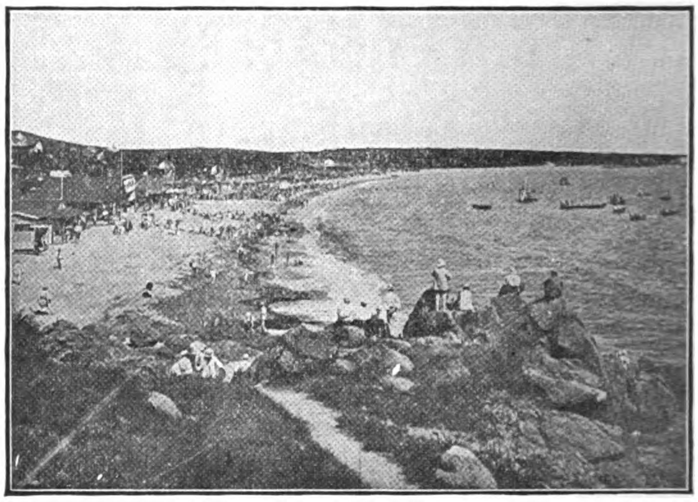
First Class Sleeping Car—A first-class sleeping car is attached to night trains Nos. 3 and 4 running between Tsingtao and Tsinan. For a berth in the sleeping car in S.Y. 3.00 for the lower berth and S.Y. 2.00 for the upper berth is charged in addition to the ordinary first-class fare, irrespective of distance.

Dining Car—A dining car is attached to through trains Nos. 1, 2, 3 and 4 running between Tsingtao and Tsinan. Meals are served to order at any time.

Ticket Agencies—Messrs. Thos. Cook & Son and their branch offices in various parts of the world. The Japan Tourist Bureau in Tokyo and their Agents in Yokohama, Kobe, Nagasaki and Peking.

Connections at Tsingtao—By steamer with Japan, Manchuria and Shanghai.

Connections at Tsinan—By Tientsin-Pukow Line with Tientsin, 6.00 & 9.38 a.m. daily, and with Pukow, 7.44 a.m. & 10.21 p.m. daily.



BATHING BEACH, TSINGTAO.

Description of Tsingtao

Tsingtao is considered the most healthful place in all the Far East. The scenery including both mountains and sea, is most beautiful. There are quite extensive forest gardens, bits of woodland here and there, and many delightful shady lanes affording most interesting walks through them.

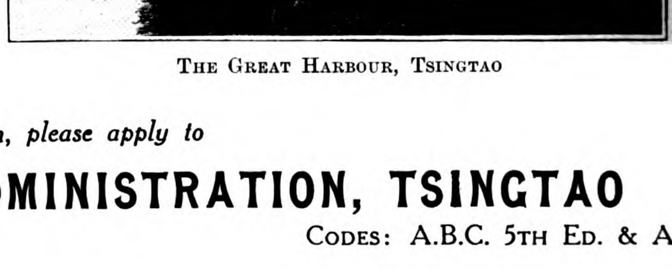
The roads are all broad, with very moderate gradients. They are of both macadamized and asphalt construction for vehicle traffic, while the sidewalks are either paved or concrete. These streets are practically all lined with beautiful shade trees.

The buildings are constructed principally in modern European style, with red tiles and white walls, contrasting pleasantly with the surrounding green mountains and blue sea.

The climate here is fine from Spring to Autumn, being neither too hot nor too cold. These climatic conditions make the place a favourite summer resort for Europeans and Americans from Shanghai, Tientsin, and other places.

The hotels are luxuriously furnished with up-to-date equipment and are under the efficient management of Mr. H. J. Hearne.

The hotel rates are $6.00 and up, per day, on the American plan.



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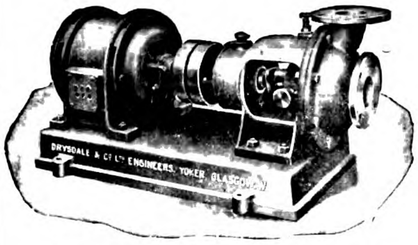

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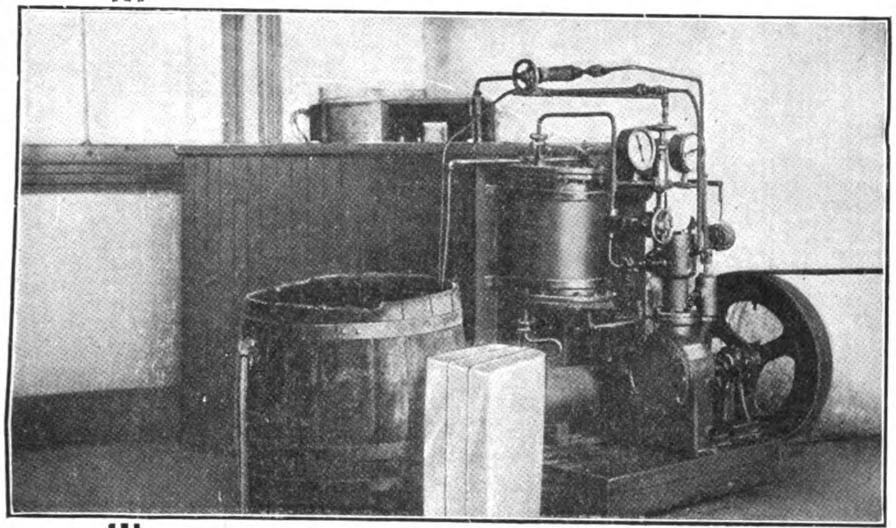

We show here a *Brunswick* installation that illustrates both the long life of the *Brunswick* machine and the satisfactory service it renders even when the service is severe and shop conditions adverse.

The machine shown was shipped to Cold Spring, N.Y., in 1911. From there it was resold a number of times, constantly giving satisfactory service, until it finally passed into the hands of its present owner in 1919.

The cut shows this *Brunswick* ice-making machine installed in the plant of its present owner in Grecia, Costa Rica. It is still giving satisfactory service in spite of the adverse shop conditions indicated. Mr. Rigioni writes : "I have had this machine since July 17, 1919 and for two years up to the present day I have been very much satisfied with it, because it operates very simply and has not given me any trouble." This is admirable testimony for a machine eleven years old and which has been buffeted from pillar to post.

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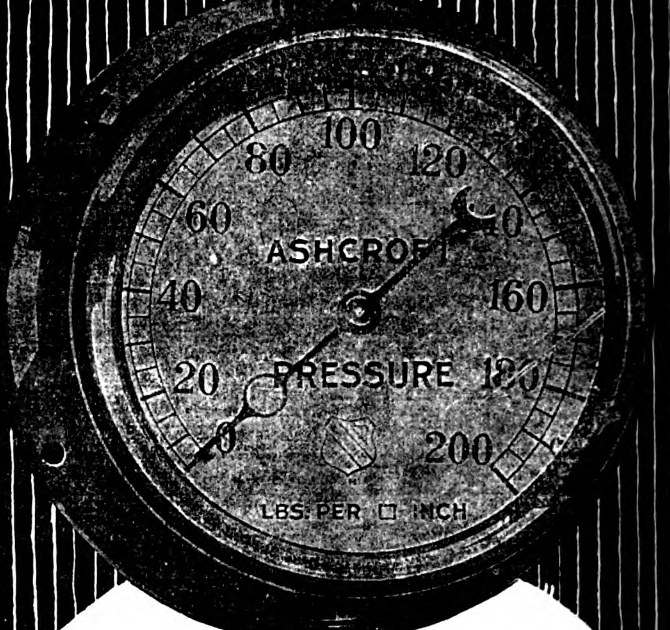

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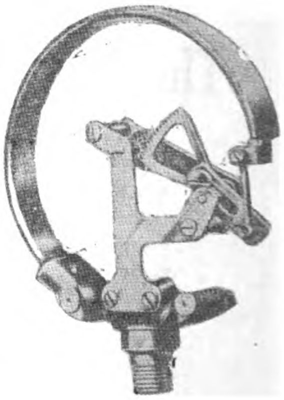

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A NORTH-CHINA TRADE DIRECTORY

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TRADE DIRECTORY.—A list of all Shanghai firms under their professional or trade headings.

AGENCIES.—Agencies held by Shanghai firms are listed alphabetically, with the firm's name after them.

STREET DIRECTORY.—A list of the streets of Shanghai in English and Chinese, with the occupants of all foreign and many Chinese houses, offices, and stores.

SHANGHAI WHO'S WHO.—An alphabetical list of the men of Shanghai, with their business addresses.

RAILWAYS.—A list of the Northern Railways of China, with their foreign and native staffs, including those resident in Shanghai.

RESIDENTIAL DIRECTORY.—A complete list of the foreign residents of Shanghai, arranged alphabetically, with their private addresses.

OUTPORT HONG LIST.—A list of Northern and Central China cities and outports with foreign firms and institutions and their staffs.

OUTPORT WHO'S WHO.—An alphabetical list of foreign men in Northern and Central China, compiled from the Outport and Railway Sections of this work.

OUTPORT LADIES' LIST.—An alphabetical list of foreign ladies, not engaged in mission work, resident in Northern and Central China.

OUTPORT MISSIONARIES.—Classified alphabetically by provinces. Under the names of the provinces are given the towns where missions are established, with list of residents. This is divided into two sections: (1) Protestants, (2) Roman Catholics. Mission Institutions, such as Schools, Colleges, etc., will be found under the respective Ports in which they are instituted.

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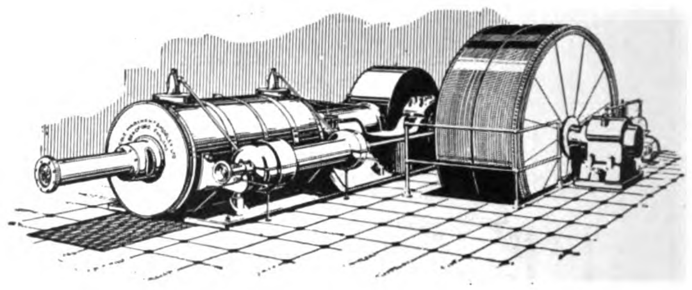

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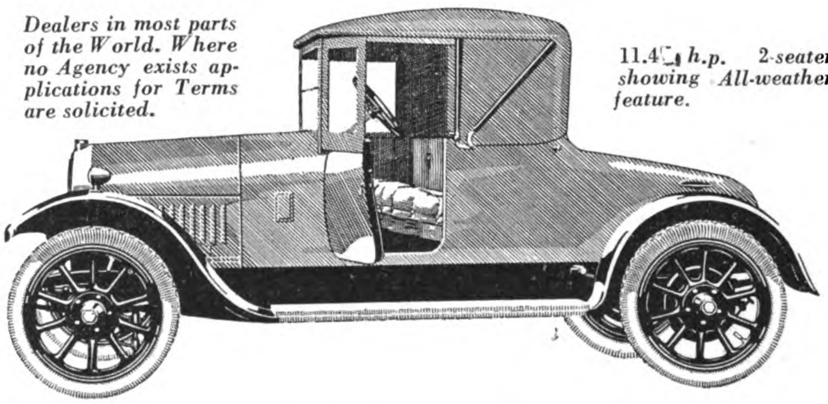

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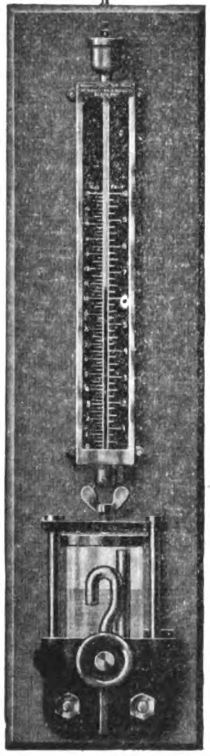

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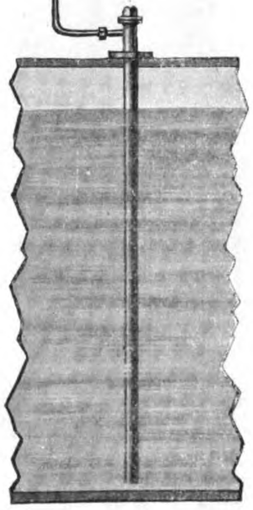

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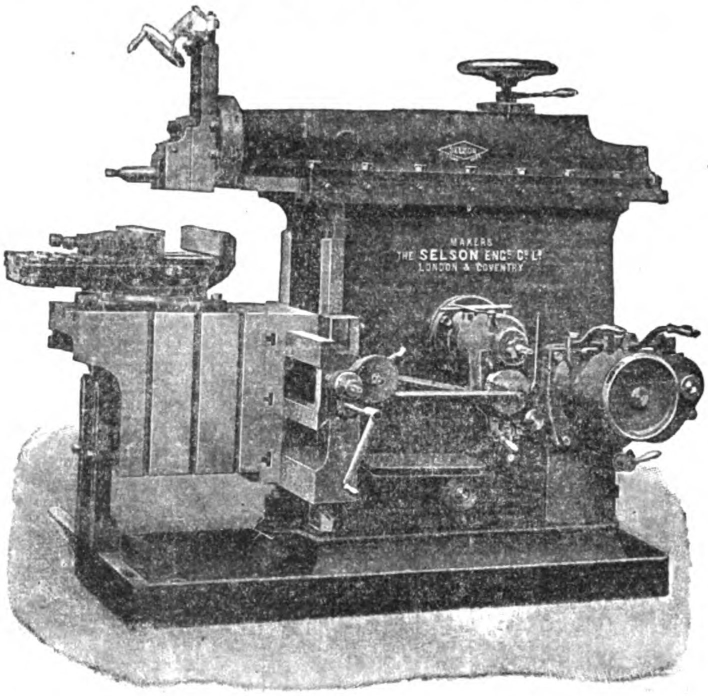

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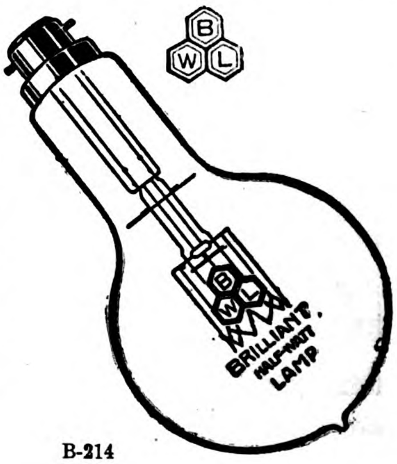

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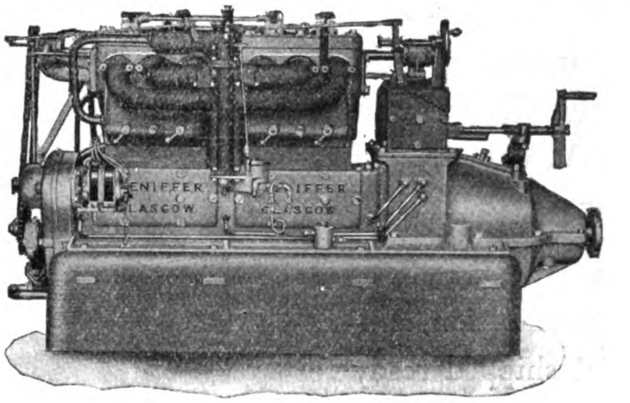

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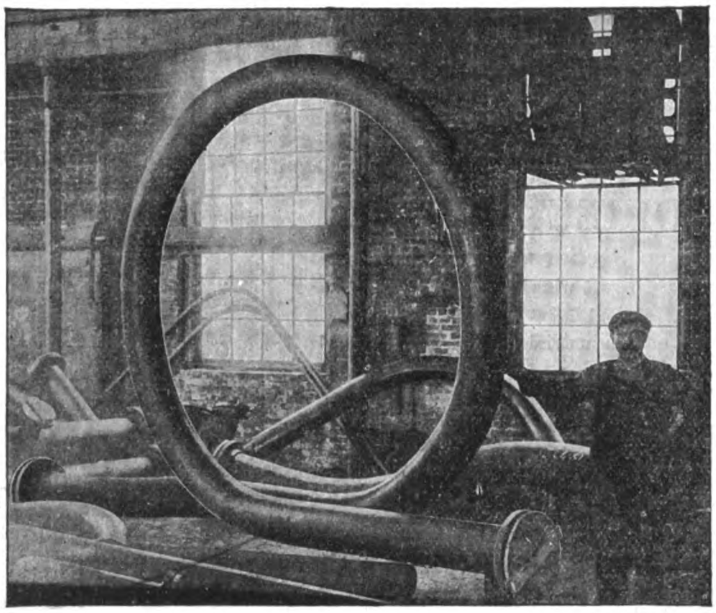

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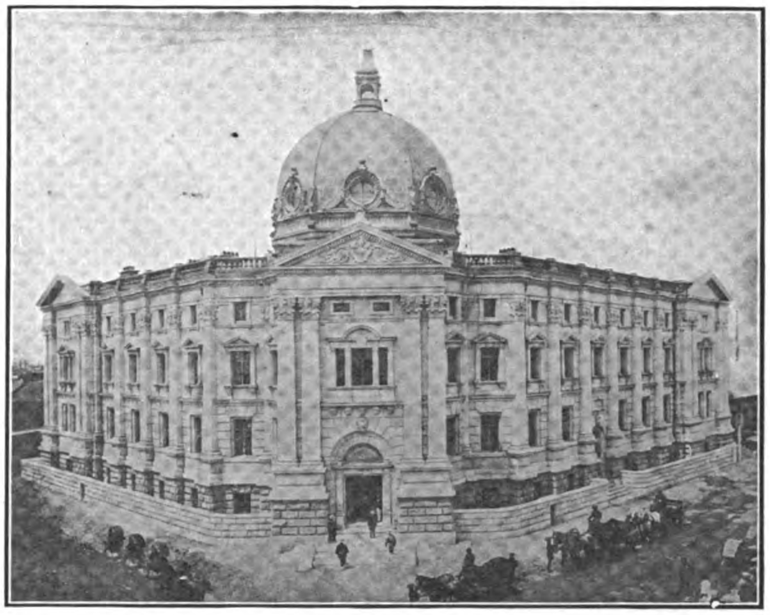

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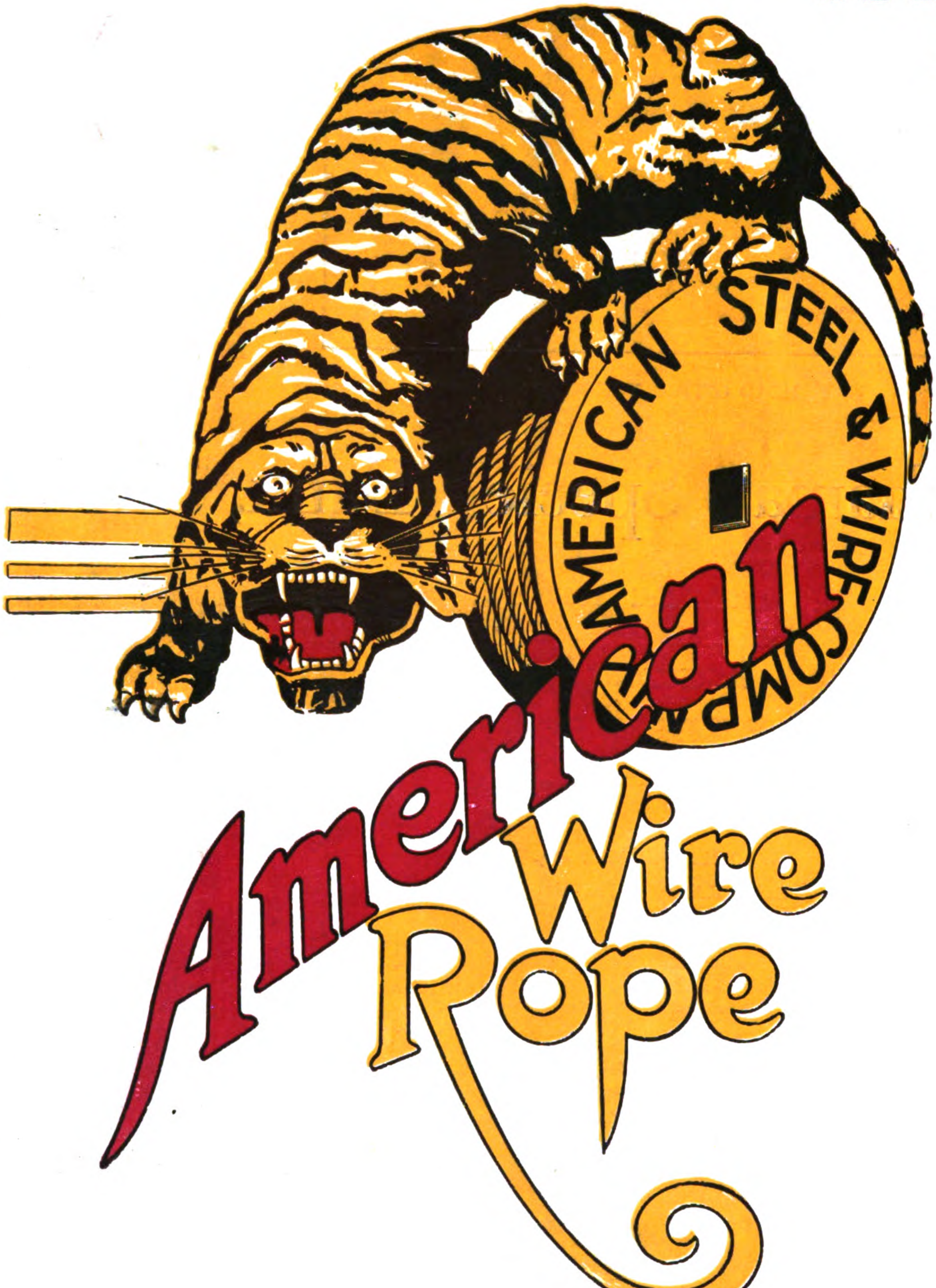

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